THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

VOL. XCII. No. 2223.] LONDON, DECEMBER 19, 1905. [57TH YEAR. PRICE 6d.

PARKER & LESTER,

— *ESTABLISHED 1830.* —

MANUFACTURERS AND CONTRACTORS. **ORMSIDE STREET, LONDON, S.E.**

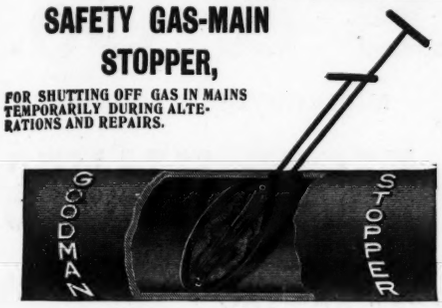
THE ONLY MAKERS OF

PATENT ANTIMONY PAINT & PARKER'S IMPERIAL BLACK VARNISH.

OXIDE PAINTS, OILS, AND GENERAL STORES, FOR GAS AND WATER WORKS.

SAFETY GAS-MAIN STOPPER,

FOR SHUTTING OFF GAS IN MAINS TEMPORARILY DURING ALTERATIONS AND REPAIRS.



SHORT'S PATENT

GAS-LEAK INDICATORS.

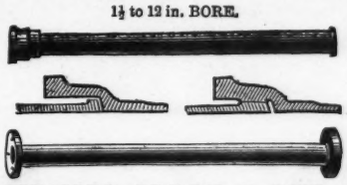
FOR GROUND USE. FLUSH BOXES ETC. HIGHLY SENSITIVE. LONG-RANGE.

FOR PURIFIER BLOW-OFF VALVES. FOR HARD USAGE.

WITH ALL LATEST IMPROVEMENTS.

GAS AND WATER PIPES

1½ to 12 in. BORE.



THOMAS ALLAN & SONS, LIMITED,

Bonlea Foundry,

THORNABY-ON-TEES.

Formerly Springbank Iron-Works, Glasgow.

ESTABLISHED 1848.

Also Manufacturers of

SANITARY AND RAIN-WATER PIPES, HOT WATER PIPES, STABLE FITTINGS, RANGES STOVES, AND GENERAL CASTINGS.

Telegrams: "BONLEA, THORNABY-ON-TEES."

CARLESS, CAPEL & LEONARD,

HOPE CHEMICAL WORKS, HACKNEY WICK, LONDON, N.E.,

And at Pharos Works, Hackney Wick.

NAPHTHA AND GASOLINE DISTILLERS AND PETROLEUM IMPORTERS,

Specially distil Carburine Spirit, specific gravity ·680, or of any other grade suitable for Enriching Gas; also Gas Oil best adapted for injecting into the Retorts, as in the Herring Process.

Importers of Petroleum for Carburetting Water Gas, or for Manufacturing Oil Gas. Distillers of Pentane, Petroleum Ether, and Naphtha for clearing the pipes of Naphthaline, &c.

Samples and Prices may be had on application.

13,000

FURNACES

FITTED.

CHEAP STEAM PRODUCTION.

TO THE EDITOR OF ENGINEERING.

SIR,—Some years ago we attached forced draught and special fire-bars to our two Lancashire boilers, with the object of burning coke dust. The load has grown, and last week I had the water and fuel carefully checked, with the following results:—

Water used in boilers from Dec. 9 to Dec. 16, as per Corporation meter .	79,300		
Fuel used from Dec. 9 to Dec. 16: Coke	£	s.	d.
dust—41 tons 4 cwt., at 1s. 11d. .	3	19	0
Washed slack—15 tons 17 cwt., at 6s. 6d.	5	3	2
	£9	2	2

This works out at a fraction under 2s. 4d. per 1000 gallons. Can this result be beaten? I may add that the water-feed to the boilers is heated by the exhaust steam from the engines to 200 deg.

Yours truly,

C. D. LENG.

High Street, Sheffield, Dec. 19, 1904.

FOR FURTHER PARTICULARS APPLY—

MELDRUM BROS., LTD., TIMPERLEY, MANCHESTER; AND 66, VICTORIA STREET, WESTMINSTER.

JOSEPH EVANS & SONS, CULWELL WORKS, WOLVERHAMPTON.

Telegrams: "Evans, Wolverhampton." London Address: Salisbury House, London Wall, London, E.C. National Telephone: No. 7089.

Please apply for Catalogue No. 8.

12,000 PUMPS IN STOCK AND PROGRESS.

TRADE MARK.

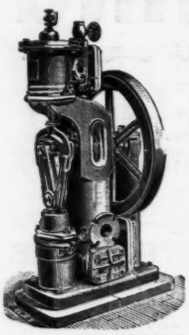


Fig. 705. "SINGLE RAM" STEAM-PUMP.

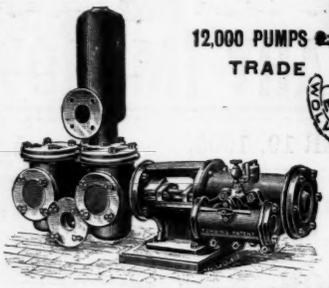


Fig. 598. "CORNISH" STEAM-PUMP FOR BOILER FEEDING, &c.

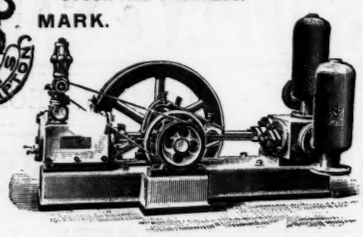


Fig. 685. "RELIABLE" STEAM-PUMP FOR TAR AND THICK FLUIDS.

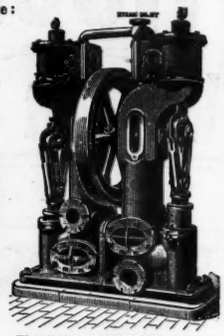


Fig. 712. "DOUBLE-RAM" STEAM-PUMP.

W. C. HOLMES & Co.

BLAST VALVE. Double-Faced Type.

MAKERS OF

DOUBLE-FACED VALVES

"HOLMES" ROTARY SCRUBBER-WASHER.

PELOUZE & AUDOUIN TAR-EXTRACTOR.

CARBURETTED

WATER-GAS PLANTS.

Complete Coal-Gas Installations.

Works: HUDDERSFIELD.

London Office: 11, VICTORIA ST., S.W.

HIGHEST AWARDS—LONDON, PARIS, COLOGNE, VIENNA, MELBOURNE, AND OTHERS.

—11 MEDALS.—

MANUFACTURERS OF TUBES AND FITTINGS OF EVERY DESCRIPTION.

WROUGHT-IRON OR STEEL MAINS UP TO 6 FEET DIAMETER FOR GAS, WATER, OIL, OR OTHER PURPOSES

SCREWING TACKLE, BOILER MOUNTINGS, VALVES, COCKS, ETC.

LONDON: 108, Southwark Street. MANCHESTER: 33, King Street West. BIRMINGHAM: 114, Colmore Row. LEEDS: 6, Mark Lane, New Briggate.

THE "KHOMA"

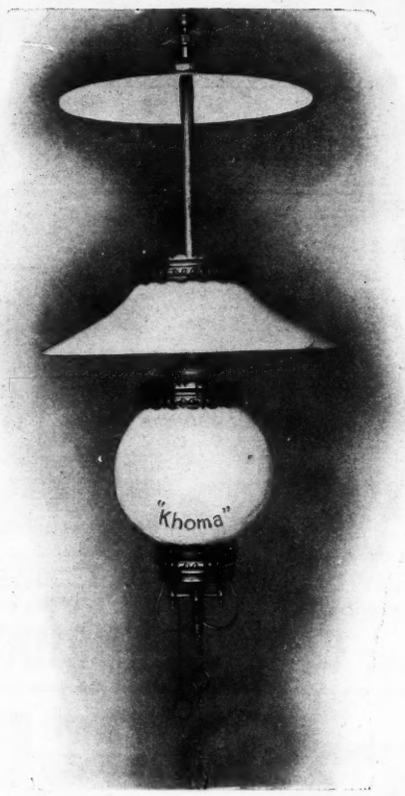
INCANDESCENT GAS ARC LAMP.

For Interior Lighting.

The only Lamp on the Market in which the Gas is properly heated and expanded before it reaches the Burner.

Imitations have not this Super-Heating Chamber for the Gas.

There are some people who have doubts as to the value of heating the gas used for incandescent lighting preliminary to combustion. The question may be simply settled, each one for himself, by comparative photometrical tests. The idea has received the support of many careful scientific investigators. Among the latest to carry their researches into this particular field are Drs. F. Haber and F. Richardt, whose valuable dissertation on "The Bunsen Flame, and Methods for the Chemical Determination of Flame Temperatures" was noticed at some length in the "JOURNAL OF GAS LIGHTING" for the 31st of January. Being towards the end of that article, it may have escaped the attention of some readers that there these investigators said: "The temperature of combustion of a gaseous mixture may be raised by a preliminary warming of the gas at the expense of the combustion products (as in regenerative furnaces), but not at the expense of the burning gas itself—that is to say, by subsequent, but not simultaneous, warming."



English Manufacture.

Our Super-Heating Chamber and Trap for Condensation or Impurities of the Gas are built on scientific and mechanical principles.

If it has not this Super-Heating Chamber, it is not a "Khoma," and not efficient.

Patents—9747, '04, and 11,148, '05.

STRONGLY AND SUBSTANTIALLY MADE THROUGHOUT.

KHOMA
GAS ARC LAMP, LTD.
Office and Works:
96, MIDDLESEX STREET,
LONDON, E.

FOUR BURNERS—500-CANDLE POWER.

Every Description of
FIRE-CLAY GOODS
OF BEST QUALITY ONLY.

Personal attention given to all orders.

MOBBERLEY & PERRY, STOURBRIDGE.

INCLINED AND HORIZONTAL RETORTS of both Taper and Parallel Sections.

SPECIALS FOR WATER GAS PLANTS
CHECKER BRICKS ALWAYS IN STOCK
LARGE STOCKS KEPT.

IMPORTANT NOTICE.

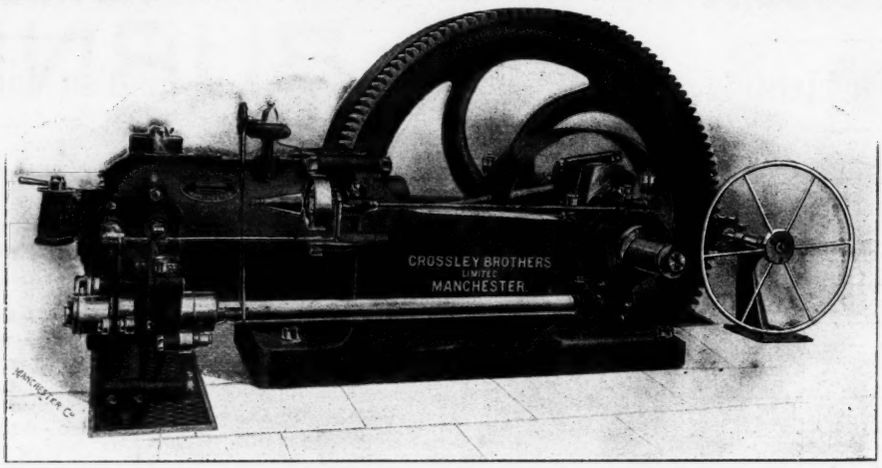
It is the practice of the "Gas World" to publish from time to time analyses of the accounts of Gas Undertakings in this Country. A number of such analyses appeared in the issue for September 16, and they show that at Fenton, Longton, Rotherham, and Tipton, some of the highest results were obtained in Gas Made and Coke Sold.

It may be interesting to Gas Engineers to learn that at these four places Winstanley's Settings are in use.

The Winstanley Speciality Company, Newton Chambers, Cannon Street, Birmingham.

CROSSLEY'S GAS-ENGINES

SUITABLE FOR DRIVING EXHAUSTERS, PUMPS, &c.



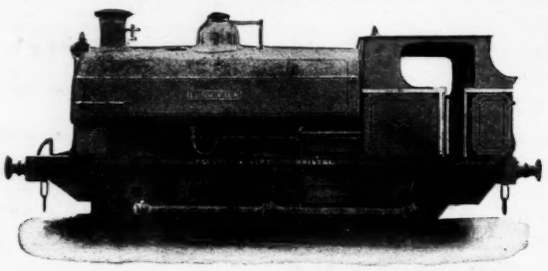
Represents XAE Type High-Speed Electric Light Engine giving 75 Effective Horse Power.

Up to the end of 1904, over 51,000 Gas and Oil Engines have been delivered, representing about three-quarters of a million actual horse power.

IMMEDIATE DELIVERY FOR STOCK SIZES OF ENGINES.

Large Number of Second-Hand Engines always in Stock.

CROSSLEY BROS., LTD., OPENSHAW, MANCHESTER.



LOCOMOTIVES

LOCOMOTIVES of all Sizes and Gauges specially constructed for Main and Branch Lines, Contractors, Docks, Gas-Works, Collieries, Iron-Works, Brick and Cement Works, &c. Locomotives of various Sizes always in Stock, ready for immediate delivery.

Photographs, Specifications, and Prices on Application.

PECKETT & SONS, Atlas Locomotive Works, BRISTOL.

Telegraphic Address: "PECKETT, BRISTOL."

NEWTON, CHAMBERS, & CO.,

LIMITED.

THORNCLIFFE IRON-WORKS, near SHEFFIELD.

Established 1790

LONDON OFFICE: **19, Great George Street, WESTMINSTER.**

Telegraphic Addresses, "NEWTON, SHEFFIELD," "ACCOLADE, LONDON."

GAS ENGINEERS, IRONFOUNDERS, and CONTRACTORS.

MANUFACTURERS OF EVERY DESCRIPTION OF

PLANT, APPARATUS, AND MACHINERY FOR GAS AND CHEMICAL WORKS.
RETORTS AND FITTINGS, MOUTHPIECES WITH SELF-SEALING LIDS.
IMPROVED COAL AND COKE HANDLING PLANT, CONVEYORS, AND ELEVATORS.
CONDENSERS, SCRUBBERS, AND WASHERS.

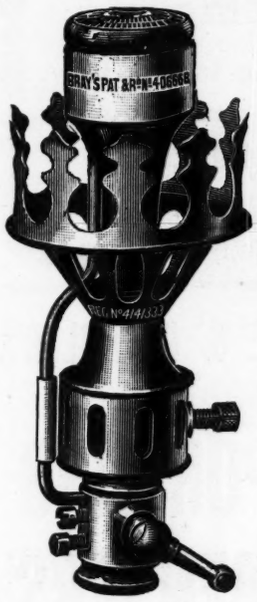
PURIFIERS with Planed Joints a Speciality.

PATENT CENTRE-VALVES, RACK AND SCREW VALVES, WOOD GRIDS AND SCRUBBER-BOARDS, CAST-IRON MAINS, AND SPECIALS.
STRUCTURAL WORK, COLUMNS, GIRDERS, AND ROOFING.
GASHOLDERS, CAST-IRON OR STEEL TANKS.

DESIGNS, SPECIFICATIONS, and ESTIMATES FREE.

PIG IRON (SPECIAL QUALITY) for Engine Cylinders. GAS COAL famous for its Unrivalled excellence.

THE "BRAY" INCANDESCENT GAS BURNER



WITH INSIDE BYE-PASS

AND THE

"BRAY" PATENT GAS ADJUSTER.

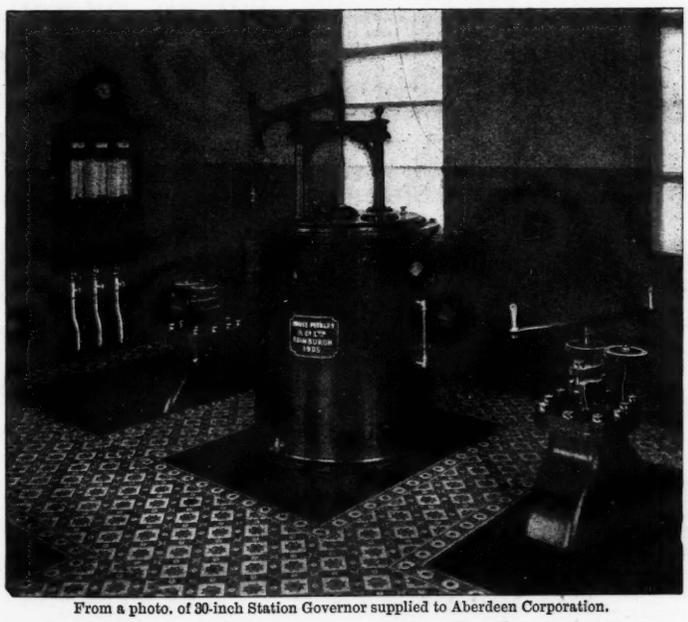
The most economical results can be obtained by using a "Bray" Burner, fitted with the "Bray" Adjusting Screw. It enables the burner to be used with any quality or pressure of gas.

OUR CATALOGUE CONTAINS ALL PARTICULARS.

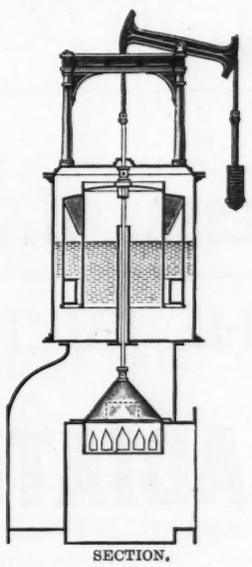
GEO. BRAY & CO., LTD., GAS LIGHTING ENGINEERS, LEEDS.

PATENT SAFETY STATION GOVERNORS.

The result of many years' varied experience in their design and manufacture, they effectually Control Pressure under the most exacting conditions.



From a photo. of 30-inch Station Governor supplied to Aberdeen Corporation.



SECTION.

The Bell is enclosed and in communication with the outlet of the Governor, thus responding to the slightest variation in outlet Pressure. Small weights are conveniently placed for operating the Governor, or "The Peebles' System of Air-Loading" from a distance may be employed. All Governors are carefully tested before being dispatched, and the material and workmanship is of the best possible description.

BRUCE PEEBLES & CO., Ltd.,

Telegrams: "Peebles, Edinburgh." **TAY WORKS, BONNINGTON, EDINBURGH.** Telephone 4244.

FOR THE **WINTER**

6

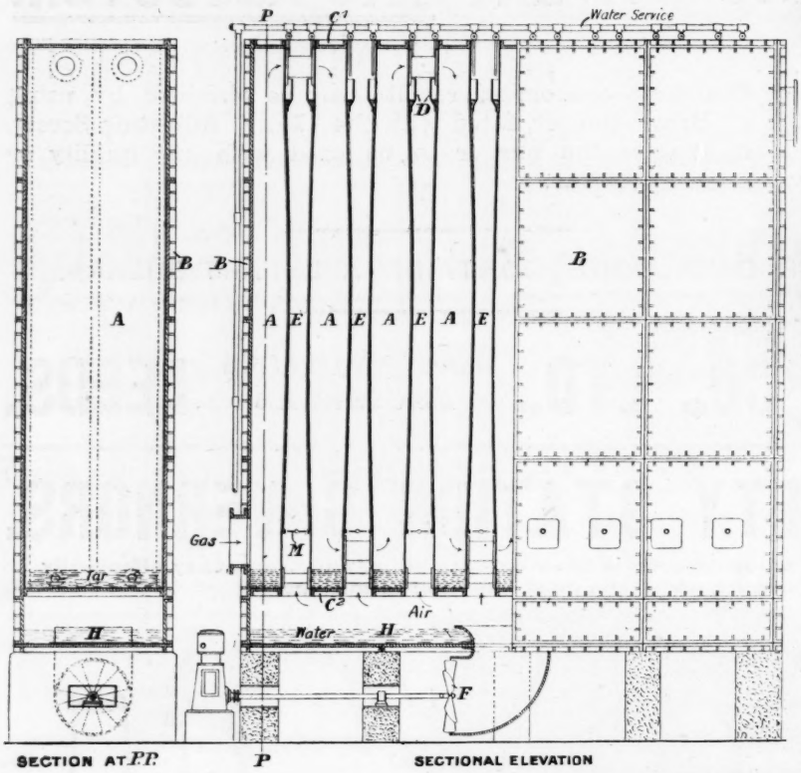
THE LAST SHALL BE FIRST.

The "**OMEGA**" is one of the last of Gas Heaters in point of time, but when you come to **EFFICIENCY**, well—**IT LEADS THE PROCESSION.**

Shall we send you Particulars?

QUICK CHEAP HEAT—thats All Heat and No Smell.

The "OMEGA" Odourless Gas Stove Co., Ltd., Wilder Street, BRISTOL.



SECTION AT P.P. SECTIONAL ELEVATION

BROWNE & CHANDLER'S

PATENT

VAPORIZING CONDENSERS.

In these Air Condensers a

GREATLY INCREASED EFFICIENCY

is secured by

INTERNAL EVAPORATION

of a Comparatively Trifling Quantity of Water, with or without Fan Draught.

SOLE MANUFACTURERS—

MESSRS. W. J. JENKINS & CO., LTD., RETFORD.

THE SILICA FIRE-BRICK COMPANY.

OUGHTIBRIDGE.

RADIATE MORE HEAT

BY USING

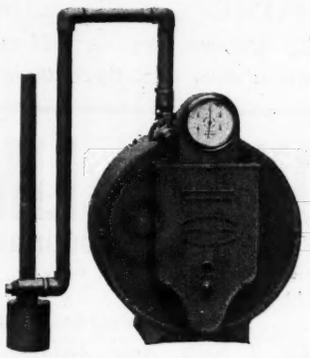
SILCO BRICK RETORTS.

SILCO BRICKS prevent all settling of setting.

SILICA BRICKS for Combustion Chambers, any shape.

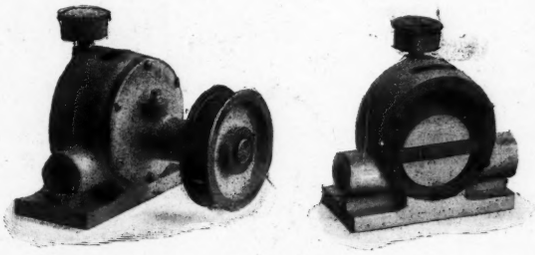
Air Meter & Rotary Blower

FOR AIR SUPPLY TO PURIFIERS.



AIR METER AND SEAL POT.

Cast-Iron Case, Tinned Copper Drum. Indicates $\frac{1}{100}$ths of 1 cubic foot. Fitted with Quadrant Cock and Seal Pot, preventing loss of gas.



ROTARY BLOWER.

(Elevation.) (Section.)

Should be connected to Gas Exhauster so that speed of both is proportionate.

MADE BY

JAMES MILNE & SON LIMITED,

MILTON HOUSE WORKS,
EDINBURGH.

LONDON. GLASGOW. LEEDS.

Gasholders

Retort Fittings Complete
PURIFIERS
Scrubbers
MAINS

Condensers

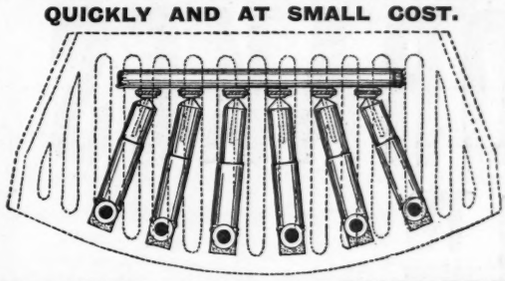
Ammonia Recovery Plant
& STEEL TANKS
Washers
VALVES

Steel Structures

ASHMORE, BENSON, PEASE & Co LTD. STOCKTON-ON-TEES. Tels. Gasholder.

FIT GAS-FIRES TO COAL GRATES

QUICKLY AND AT SMALL COST.



TILLEY'S (PATENTED) BURNERS

Can be Adjusted to Shape of Grate and Gas Pressure *in situ.*

TILLEY BROS.,
53, KINGSLAND ROAD, LONDON, N.E.

EVERITT'S

PATENT TAR-EXTRACTOR

As a Naphthalene Remover.

The Exhaust Steam heats up the Tar and the Gas, and enables it to remove the maximum amount of Naphthalene. By removing the Tar, no Naphthalene is carried forward to the Scrubbers, except in strong and thorough combination with an **EXCESS** of light hydrocarbons, so evenly distributed and always sufficient in quantity to prevent the action of ammonia on the phenols liberating the Naphthalene dissolved by them.

SOLE MAKERS:

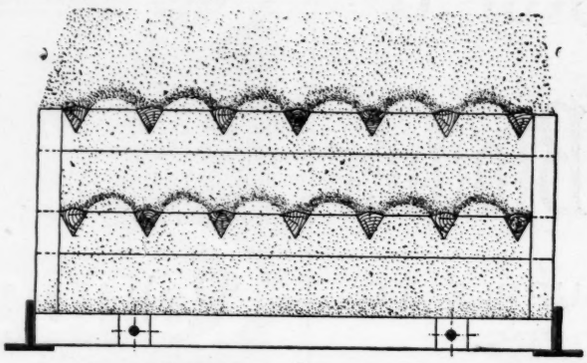
ROBERT DEMPSTER & SONS, LTD.,
ROSE MOUNT IRON-WORKS,
ELLAND, Yorks.

"STANDARD" PURIFYING GRIDS.

(F. D. MARSHALL'S PATENT.)

THE ONLY GRID WHICH ENSURES THE FORMATION OF SUPPORTING ARCHES.

Orders Received from—
ABERCARN,
ABERYSTWYTH,
ARMAGH,
BARNET,
BECKTON,
BIRMINGHAM,
CHICHESTER,
HAMPTON COURT,
HOLMFIRTH,
ILFORD,
LEA BRIDGE,



Orders Received from—
LEYLAND,
LIVERPOOL,
LONDONDERRY,
PORT ELIZABETH,
POYNTON COLLIERIES,
REDHILL,
RICHMOND,
ST. IVES,
TICEHURST,
WORTHING.

KIRKHAM, HULETT, & CHANDLER, LIMITED,

Palace Chambers, Bridge Street, Westminster, S.W.

Sole Agents for the Berlin-Anhaltische-Maschinenbau Act. Ges. Specialities.

THE WIGAN COAL & IRON CO., LIMTD.,

Are exclusive Owners of the well-known HAIGH HALL & KIRKLESS HALL GAS COAL COLLIERIES, and supply the Best Wigan Arley Mine Gas Coal, Gas Nuts, Gas Cannel, Cannel Nuts, &c.

MIDLAND AND WEST OF ENGLAND DISTRICT OFFICE: *6, CORPORATION STREET, BIRMINGHAM—Sole Agent: A. C. SCRIVENER.*
Telegraphic Address: "WIGAN, BIRMINGHAM." Telephone No. 200.

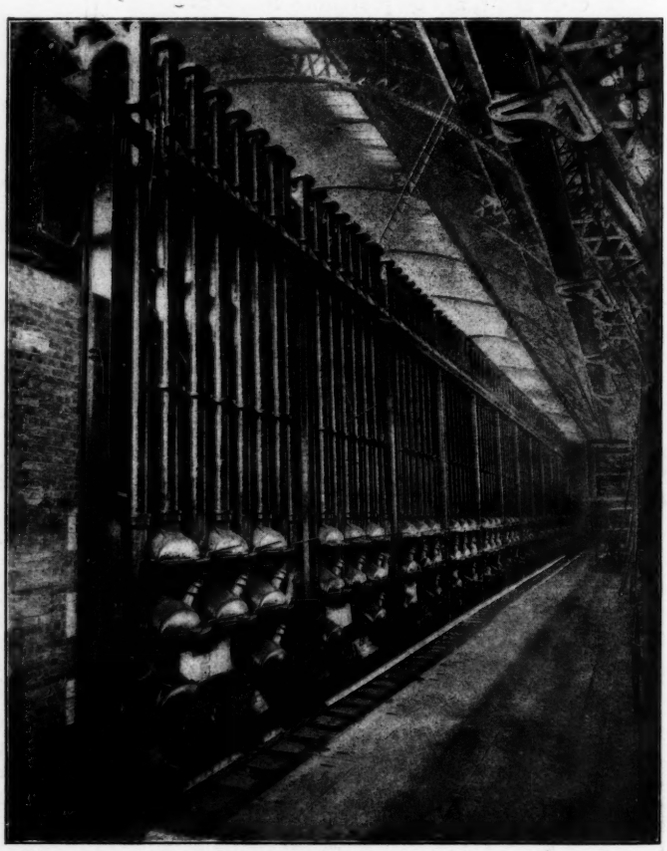
LONDON DISTRICT OFFICE: *6, STRAND, LONDON—C. PARKER & SON, Sole Agents.*
Telegraphic Address: "Parker, London."

DRAKES LTD. HALIFAX.

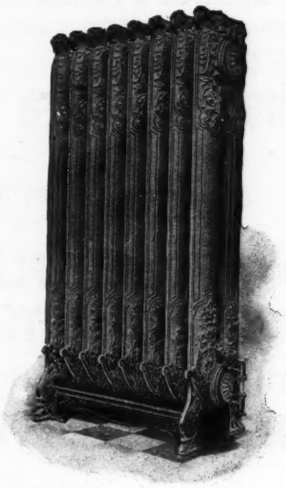
LONDON OFFICE:
181, QUEEN VICTORIA ST., E.C.

MELBOURNE:
31, QUEEN STREET.

Inclined Retort Installation, With Hot-Coke Conveying Plant.



Blow, Blow, thou Wintry Wind



but without the least effect when the place is warmed with the

"MARS" Gas-Heated Steam Radiator . . .

By
ARDEN HILL & CO.,
"ACME" WORKS,
BIRMINGHAM.

(Under licence from John Wright & Co.)

COAL TAR PRODUCTS.

Benzol, Toluol, Solvent Naphtha, Creosote Oils, Grease Oils, Carbolic Acid, Crude Creosote Salts, Granulated (Crude) Naphthalene, Sublimed Naphthalene, Anthracene, Refined Tar, Pitch, also Sulphate of Ammonia.

For Prices apply to the **SOUTH METROPOLITAN GAS COMPANY,**
709, OLD KENT ROAD, LONDON, S.E.

Works: ORDNANCE WHARF, EAST GREENWICH, LONDON, S.E.

Telegraphic Address: "METROGAS, LONDON."

BUHLMANN INCANDESCENT MANTLES.

These Mantles are manufactured by a Patent Process upon a specially prepared Ramie Base which gives great strength and elasticity and will be found under proper conditions to retain their lighting value for upwards of 2000 hours.

BRITISH MANUFACTURE.

All Mantles are Guaranteed—
SPECIAL QUALITY "C" MANTLES.
CLASS "B" MANTLES.
DUPLEX MANTLES.
TREBLE THREAD MANTLES.
No. 2, 3, and 4 KERNS.

WRITE FOR SPECIAL CONTRACT PRICES, &c., TO

BUHLMANN INCANDESCENT SYNDICATE, LTD.

WESTON STREET, DEVON'S ROAD, BROMLEY-BY-BOW, LONDON, E.

EXHAUSTING MACHINERY.

Oldest Makers of High-Class Exhausting Machinery of all Capacities and for all Purposes.

WALLER'S PATENT 3 AND 4 BLADE EXHAUSTERS

Require less Steam and maintain a steadier Gauge than any other type.

OVER 1000 SUPPLIED.

WALLER'S PATENT "COMBINED" EXHAUSTING SETS FOR SMALL WORKS.

With Steam or Gas Engine, and all Accessories self-contained on one base plate. From 500 cubic feet to 10,000 cubic feet per hour.

SPECIALLY DESIGNED EXHAUSTER SETS FOR WATER-GAS PLANTS.

EXHAUSTING MACHINERY FOR BYE-PRODUCT PLANTS.

COKE-BREAKING MACHINERY.

TAR, LIQUOR, AND WATER PUMPS.

GEORGE WALLER & SON,

Phœnix Iron Works, STROUD, GLOUCESTERSHIRE.

London Office: 165, QUEEN VICTORIA STREET, E.C.

Telegraphic Addresses { Stroud: "Waller, Brimscombe." / London: "Weighbeam, London." }

Telephone Numbers { Stroud: 210 Brimscombe. / London: 2420 (P.O.) Central. }

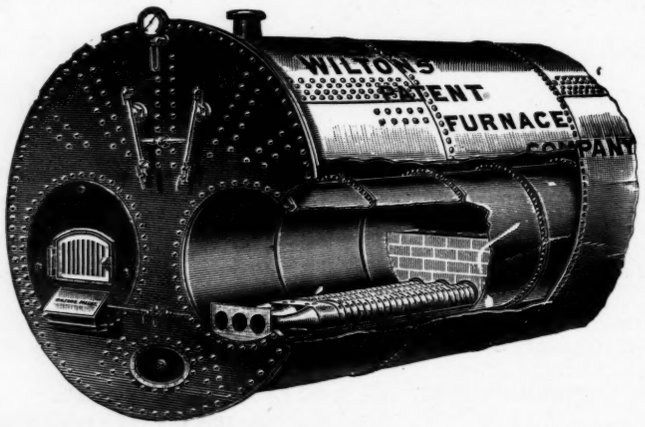
Agents for Scotland: D. M. NELSON & Co., 53, Waterloo Street, Glasgow.

WHEN ORDERING YOUR NEW BOILERS SPECIFY

7000 WILTON'S 7000

IN USE. PATENT FURNACES. IN USE.

16 TO 18 per cent. CO_2



16 TO 18 per cent. CO_2

FULL PARTICULARS AND PRICES ON APPLICATION TO

THE CHEMICAL ENGINEERING CO.

AND

WILTON'S PATENT FURNACE CO.,

79, MARK LANE, E.C.

Telephone: No. 2669 AVENUE.

Telegrams: "EVAPORATOR, LONDON."

WORKS: MIDLAND RAILWAY GOODS STATION, HENDON.

CONTENTS.

EDITORIAL NOTES.

Gas, &c.—
The Greatest Smoke Abaters 801
Affairs of the Continental Union Gas Company, Limited 802
Iron and Steelwork Construction . . . 802
Stamp Duty on Corporation Fund Investments 803
Rejection of the Paris Municipal Gas Bill . 803
Professor Boys' New Gas Calorimeter—Important Report on the Public Lighting of Edinburgh—Properly Fencing Off an Excavation—The Complaints of the Gas Supply at Nottingham—The Mond Gas Business 803

The Derby Naphthalene Process at Sheffield and at Home 805
From Gas to Electricity at Sutton 805
Electric Lighting Memoranda 806
Gas Stock and Share Market 807
A Gas Calorimeter. By Professor C. V. Boys 808
The Public Lighting of Edinburgh—Report by Mr. J. F. Simmance 810
Gas Fires and Coke and Smoke Abatement . 818
Developments in "Omega" Heaters . . . 825
"Neptune" Gas-Heated Circulating-Boiler . 825
Association of Engineers-in-Charge—Mr. J. W. Blakey on High-Pressure Gas Illumination 826
London and Southern District Junior Gas Association—Mr. J. G. Clark on Modifications of the Harcourt Table Photometer. 826
Manchester District Junior Gas Association . 829
Scottish Junior Gas Association—Eastern District—
Mr. James Simpson on Experiences in a Small Gas-Works 830
Mr. W. Mitchell on Retort-Settings in Relation to Carbonizing 831
British Association of Water-Works Engineers—Winter Meeting 833
Society of Engineers 833

CORRESPONDENCE.

The New Gas-Testing Burner 837
Price of Gas to Users of Suction-Gas Plant . 837
Laying Gas-Pipes under Footways. . . . 837
The Salaries Question 837

REGISTER OF PATENTS.

Gas-Producers—Hall-Brown, E. 834
Reflectors for Street-Lamps—Lord, W. T. . 834
Inverted Incandescent Gas-Lamps—Altman, J. 834
Gas Igniting and Extinguishing Apparatus—Down, H. L., and Wiseman, D. H. . . . 834
Change-Giving Mechanism Particularly Applicable to Prepayment Gas-Meters—Rotherham, K., and Johnson, W. 835
Gas-Producing Plants—Grice, H. J. . . . 835
Lighting Gas-Lamps by Electricity—Thompson, W. P. (Freudenthal, O.). 835
Anti-Vibration Device for Incandescent Gas-Burners—Harris, W. P., Balcarras, R. K., and Hemmings, J. F. 835
Gas-Burners—Lake, H. H. (Jackson, B. F.). 836
Stopping Leaky Pipe Joints—Dresser, S. R.. 836
Coupling for Spigot and Socket Pipes—Dresser, S. R. 836
Stopping Leakage of Collar-Pipe Couplings—Dresser, S. R. 836
Patent Notices 836

LEGAL INTELLIGENCE.

High Court of Justice—Chancery Division—New Inverted Incandescent Gas-Lamp Company *v.* Cope and Timmins, Limited 837
Corporation of Manchester *v.* New Moss Colliery Company, Limited 838
High Court of Justice—Referees Court—Ocean Accident and Guarantee Corporation, Limited, and Others *v.* Ilford Gas Company 839
West Riding Assizes—Kershaw *v.* Sheffield United Gaslight Company—An Unsuccessful Action for Damages for Personal Injuries 839
Broughty Ferry Gas Worker's Dismissal. . 840

MISCELLANEOUS NEWS.

The Gas Question in Paris 840
Locomotives and Waggons on Railway Sidings under the Factory Act—Amendments Proposed to the Regulations Affecting Gas Undertakings 840
The Quality of Gas at Nottingham . . . 841
Continental Union Gas Company, Limited . 841
Lecture on "Gas Manufacture" at Reading 843

MISCELLANEOUS NEWS (*continued*)—

Stock and Share List 843
Proposed Removal of Sulphur Restrictions . 844
Price of Gas at Nantwich 844
Lighting of Tweedmouth and Spittal—Incandescent Gas Supersedes Electric Lighting 845
Metropolitan Water Board 845
Proposed Purchase of the Crewkerne Water-Works. 845
Notes from Scotland 846
Current Sales of Gas Products 848
Coal Trade Reports 849
Cheaper Gas for Power Purposes at Mansfield 850
The New Water Scheme for Bacup . . 850
Effect of Birmingham Welsh Water on Galvanized Ware 850
Water-Works Extensions at Wolverhampton 850
Mr. R. Watson on the Measurement of Illumination 851
A Shipley Compensation Water Arbitration . 851

PARAGRAPHS.

From Early Volumes of the "JOURNAL"—July 11, 1853 807
Distributing Gas at High Pressure by Means of Fans 810
Personal and Obituary 817
Tar Paving for Roadways—The Use of Steel Piling 817
"Consultations Free"—The Transactions of the Société Technique. 824
The Introduction of the Telescopic Gasholder—An Association of Victorian Gas Engineers 825
Gas Suffocation Case at Sedgley 836
Fire at the Wolverhampton Gas-Works—Acquisition of the Blyth Water-Works by the District Council 840
Corporation Gas-Fitting at Southport—Consumption by Gas-Cookers at Oldham . . 843
Leeds Gas Workers and the Six-Day Week . 847
The New Water-Works of the Loughborough Corporation—Prepayment Meters at Stalybridge. 849
Fog and Gas Consumption in Manchester—Incandescent Gas Lighting in the City of London—Heavy Sentences for Slot-Meter Robberies 851

ONE-THIRD OF THE TOWN GAS CONSUMED BY ALL ENGLISH SPEAKING PEOPLES IS NOW

CARBURETTED-WATER-GAS.

Messrs. Humphreys & Glasgow and their American Colleagues, The United Gas Improvement Company, have jointly constructed **836** Sets of Double-Superheater Plant, aggregating a capacity of **632,600,000** cubic feet per day. This represents over **80** per cent. of all Carburetted-Water-Gas Construction throughout the World.

HUMPHREYS & GLASGOW.

36 & 38, VICTORIA STREET, LONDON, S.W.
Telegrams: "EPISTOLARY LONDON."

UNITED STATES OFFICE:
31, NASSAU STREET, NEW YORK

THOMAS GLOVER & CO.'S

PATENT NEW IMPROVED PREPAYMENT METER

For Pennies, Shillings, or any Coin.

Simple in Mechanism.
Positive in Results.
Price Changer *in Situ.*

GUARANTEED FOR FIVE YEARS.

Telegraphic Address: "GOTHIC, LONDON." **Telephone No. 6159 Bank.**

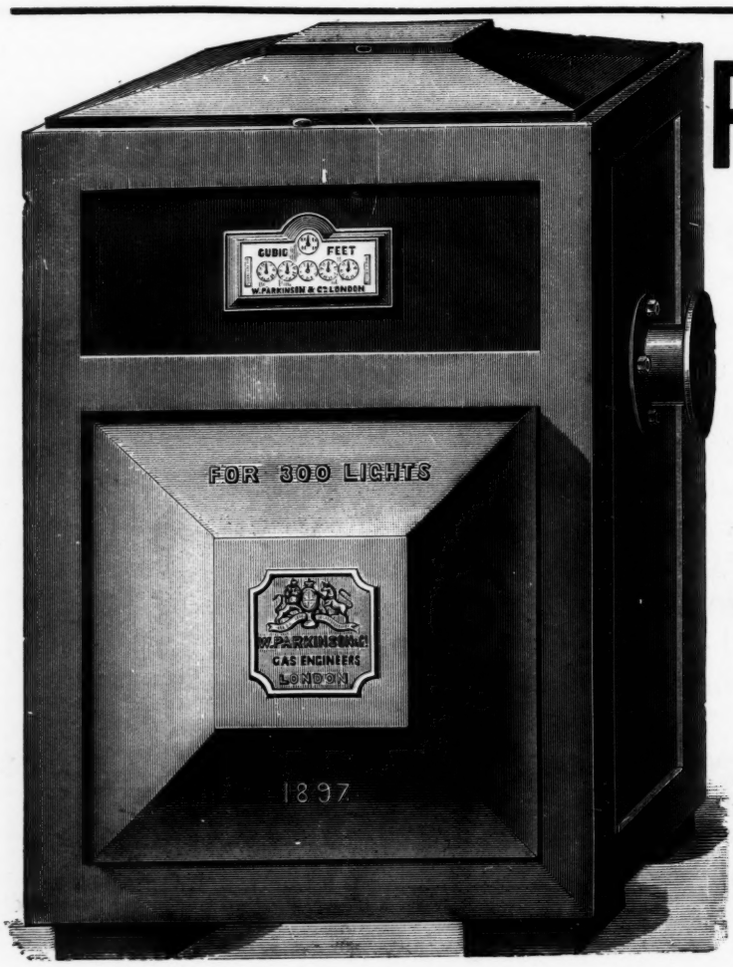
THOMAS GLOVER & CO., LTD.,

GAS-METER MANUFACTURERS,

LATE OF CLERKENWELL, NOW 49, QUEEN VICTORIA STREET.

Telegraphic Address: "GOTHIC, LONDON." **Telephone No. 6159 Bank.**

BRISTOL:	BIRMINGHAM:	MANCHESTER:	GLASGOW:	BELFAST:	MELBOURNE:
28, BATH STREET.	57 & 58, BROAD STREET.	132 & 134, CORN EXCHANGE BUILDINGS.	26, WEST NILE STREET.	8, EXCHANGE PLACE, DONEGALL STREET.	28, WRIGHT'S LANE, LONSDALE STREET.
Telegraphic Address: "*GOTHIC.*"	*Telegraphic Address:* "*GOTHIC*"	*Telegraphic Address:* "*GOTHIC.*"	*Telegraphic Address:* "*GASMAIN.*"	*Telegraphic Address:* "*GOTHIC.*"	
Telephone No. 1005.	Telephone No. 5069.	Telephone No. 3898.	Telephone No. 6107 Royal.		Telephone No. 3716.



PARKINSON'S

DRY METERS

ALL SIZES KEPT IN STOCK.

PARKINSON AND W. & B. COWAN, LTD.
(*Parkinson Branch*).

COTTAGE LANE, CITY ROAD, LONDON. | BELL BARN ROAD, BIRMINGHAM.

JOURNAL OF GAS LIGHTING, WATER SUPPLY, &c.

EDITOR & PUBLISHER: WALTER KING. OFFICE: 11, BOLT COURT, FLEET ST., LONDON.

VOL. XCII., No. 2223.—TUESDAY, DECEMBER 19, 1905.

EDITORIAL NOTES—GAS, &c.

The Greatest Smoke Abaters.

PROPITIOUS indeed were the atmospherical conditions in London on Monday last for ushering in the Smoke Abatement Conference and Exhibition, promoted conjointly by the Sanitary Institute and the Smoke Abatement Society. The great Metropolis was enveloped in an almost impenetrable fog—one of the kind in which electric arc lamps (conscientiously it can be said of the flame type also) seem to contract their rays within the small circumference of their globes as though the surroundings were most uncongenial, in which too the Westminster City Council release from store their portable oil-flares and acetylene standards to aid the wayfarer and vehicular traffic to pass safely through the density at dangerous crossings, and in which also even the incandescent gas-lamps —the best of illuminating means in fogs—look far from their best, though piercing to a greater extent than other illuminants the impurity-burdened mist involving them. Such were the conditions of the day preceding the inaugural meeting of the delegates from all parts of the country to the conference; and the conditions enhanced the attention that the Daily Press paid to the proceedings. But all possible conferences and talk will never relieve us from the occasional visitations of the mists which act as the aërial support for the gaseous, carbonaceous, and other impurities which constitute the fog, and which in turn prevent Nature's agents from doing their work in dispelling the mists. It is therefore to the impurities that the smoke abatement propagandists direct their labours; and these impurities are, in greater part, the product of imperfect combustion and the wasteful systems of utilizing our fuel. Unscientific method has to be supplanted by that which is scientific; and, as our report of the proceedings shows, there was at the meetings almost unanimity among the men of science, the medical practitioners, and the municipal representatives, that the most effective, scientific, and convenient means of obtaining heat, whether for cooking or warming, and of preventing the constant eructations of impurities from countless chimneys, were found in the employment of the gaseous product of coal. And this is not the whimsical view of fanaticism, but an opinion deduced from long experience.

This cannot but be eminently gratifying to all concerned in the gas industry, who, although the primary cause of their development of the use of gas cooking-stoves and gas-fires was business rather than smoke prevention, have, as a matter of fact, done more as abaters of the costly and disconcerting nuisance than all those who have voluntarily made it their work to preach the correct principles of reform. London is a prominent example of what has been done in this respect; but though the figures for the Metropolis have an impressive magnitude, it can be said that those figures likewise have a proportionate application to every city and town in the country where there exists a progressive gas undertaking. The progress in the conversion from the barbarous methods of heating by coal—from the kitchen to the bedrooms—to the utilization of the purified gaseous product of coal has been remarkable during the past ten years, and particularly in cookers among the prepayment class of consumers. This is shown in an extraordinary manner by figures kindly supplied to us by Mr. D. Milne Watson, the General Manager of the Gaslight and Coke Company. Including the cooking stoves and heaters on hire and sold by the Company, in 1895 they only boasted a total of 71,137; but on June 30 last, the total had swollen to remarkable dimensions —viz., 349,397. Of course, this does not include all the gas stoves and fires purchased privately apart from the Company. Thus in the ten years, the cookers, fires, and other heating appliances that had been passed through the Company's hands into their district increased by no less than 278,260. Then if we turn to the address delivered by Sir George Livesey, as Chairman at the first ordinary sitting of the conference last week, it is seen that the South Metropolitan Gas Company had no less than 243,714 cooking-stoves in use in their area; while in the case of the Commercial Gas Company, Mr. H. D. Ellis supplies to us figures which show that the cooking-stoves and gas-fires on hire and sold by them now number 41,363; while ten years ago there were only about 5000 cookers and fires on hire, and very few sold. Sir George Livesey, from figures which he has collected, places the number of cooking-stoves alone in use in the Metropolis at 547,408; and he further computes that at the present time about 1000 per week are being fixed. By that grand total London has been relieved of the emanations of a like number of chimneys; and to that extent have the users of these fires contributed to the amelioration of the defiled atmospherical conditions with which they and their fellow-citizens are often beset. It is a wonderful record; and it justifies the claim we make that the suppliers of gas are the greatest abaters of the evil which those who were assembled at the conference last week desire to suppress, and that the most effective means of so doing are those which gas suppliers offer.

There is not a portion of the report which we give of the proceedings at the conference which those responsible for the commercial side of the business of a gas undertaking should pass over. Throughout, it is pregnant in lesson and suggestion; and the spontaneous testimony from men capable of giving independent judgment as to the internal and external advantages of gas and coke as fuels, is valuable for the use that can be made of it in disseminating knowledge of these matters. Occasionally, we hear of complaint being made of discomfort arising from the use of gas-fires; and Sir Oliver Lodge in his presidential address positively asserts that whatever justification there may be for this is the fault of the user. It is all a matter of proper chimney draught. Chimneys that are unsuitable for coal-fires are thought to be suitable for gas-fires—simply because the products of combustion are invisible, whereas the products of combustion of a coal fire are visible. This, of course, is the mistake of ignorance; and it was emphasized by Professor Cohen, of Leeds, in his paper when he said that, "with a "proper chimney draught, the emission of noxious gas from "gas-fires is a myth." Teach consumers, from Sir Oliver Lodge's mouth, what a gas-fire is, and they will appreciate the crudeness of the coal fire and the nearest approach to scientific perfection that heating by gas gives to the user. "Every coal fire," says Sir Oliver, "is to some "extent a gas-fire, and a very bad one at that;" and the products of combustion are of the most pernicious. This is a feature to which too little consideration is ever paid; and there would be less complaint of gas-fires if this were well understood, and consumers appreciated that the conditions that are not good for a coal fire cannot be good even for the best constructed of gas-fires. The promotion of ventilation by gas-fires is another beneficial point; whereas in the case of electric radiators, to their known indifferent heating power is added the promotion of an insanitary condition of the atmosphere of rooms by not contributing to the circulation of the air, as does a gas or a coal fire by continuous withdrawal.

Enormous as has been the success of gas-cookers, it would have been much greater had the hot-water supply difficulty not stood in the way. Another lesson of the conference is that there is little public knowledge as to what can really be effected by hot-water circulating systems with the assistance of a gas-heated boiler. There are now several meritorious systems at hand; and they have only to become known to effect a more extended adoption.

But to return to the objects that the promoters of the conference last week had specially in view, it is beyond dispute that no amount of legislative action will effect so much as what is appositely termed "missionary enterprise." Any attempted imposition of compulsory measures, interfering with the domestic freedom of the householder, would be seriously resented, and it would hinder rather than help in

solving the great problem of the abatement of smoke. What has been done by gas suppliers in the substitution of gas for coal in dwelling-houses and other establishments directs the course of action. The denseness of fogs in cities and towns typifies the vastness of the ground yet unbroken, and shows the multitude yet to be converted to the most rational method of heating. Excellent as is the progress made, the work will be immensely accelerated by one thing, and that is Cheap Gas—gas of good calorific value and lower illuminating power, at prices reduced from those required for the now unnecessary richer gas. Towards that end we are unerringly drifting; and the smoke abolitionists are fully alive to the fact that the more rapid the progress of the gas industry in this direction, the quicker will be the response on the part of the public to their own votive labours.

Affairs of the Continental Union Gas Company.

It is with no little satisfaction that we find duty claiming from us a recognition of the tokens of the breaking of brighter days for the Continental Union Gas Company and the Union des Gaz, with which, through investment and common administration, the former is united. The duty is a more genial one than unfavourable criticism when things have been going adrift. There is no doubt that the troubled period of the past two or three years will prove for all interested in these undertakings a veritable blessing, though for a time it was disguised, and involved much anxiety and trouble for many individuals, and a considerable sacrifice of money. But these latter, by the aid of the salutary lessons of the past, time can wipe out; and throughout the accounts and the statement made by the Chairman (Mr. Arthur Lucas), at the meeting of the Company last Tuesday, there are indications that the work has begun, and is having an immediate effect. Of course, no body of men—Directors or otherwise—when they find themselves enveloped by difficulty such as there has been in connection with this Company, can, of their own volition, instantly divest themselves of it, and claim the antithetic condition. It is not many months ago that the Company were at the height of their troubles. But circumstances have favoured the Board. Apart from their own personal effort and an eager desire on the part of the officials and those who have been entrusted with the work of rehabilitating the concern to faithfully do their individual part, and apart, too, from all the special gas engineering and administrative experience in Italy that Mr. A. F. Phillips has brought to the Board, the past few months have been graciously disposed to the Company, and have made their prospects decidedly brighter. More peaceful conditions have existed in Italy. The discontent that was brooding over labour has largely vanished; and Italy shows evidence of trade expansion and greater prosperity. Therefore, on the one hand, the labour within the gas-works has exhibited a more pacific tendency, and, on the other, the sales of gas have increased, coal has decreased in price, and residuals have yielded a better return per ton. This is all very gratifying; and it came most opportunely for the Board in their endeavour—sternly started and steadfastly pursued—to restore their concern in every particular (regarding the two Companies as practically one) to a state of soundness.

With respect to the Milan works, which have been, for professional gas men, the cynosure in the Company's operations of late, the new retorts are giving every satisfaction, and improved carbonizing results are being obtained. We have every ground, aside from the statement of the Chairman, to believe this is the case; and there is no reason why it should not be, inasmuch as there is the Chairman's authority for stating that "the men have been working "better, and at present are giving no trouble." If this and the brighter commercial conditions of the country continue, then the Company, under the fresh influences brought to bear upon it by adversity, may be expected to construct for itself a strong position. But it is not to be done in a day. The increasing business necessitates new works; and both at Milan and Genoa new ones are about to be commenced. At the latter city, the new works will occupy a new site; and there is opportunity there for Mr. F. D. Marshall to give full play to his ability as a designer. When the scheme has matured, it may be expected that in it there will be much of engineering interest. Meantime, the new works will necessitate a considerable outlay of capital, and the capital will entail charges for interest or dividend. Under the circumstances of the Company, and recognizing what must be spent in the near future, there can be no sympathy, immediately on brighter appearances, with any demand, direct or indirect, for a higher dividend. That a higher dividend is not being paid at the present time is due to the errors of the past—distant and modern; that a higher dividend is not among the possibilities of the near future is due to the rectification of errors and the necessity for providing for extended business. There must be reasonableness having regard to the position.

One other point. As will be seen, the Chairman, in the opening lines of his address, made ample reparation for the slight that at a former meeting he, without due consideration, we fain believe, placed upon gas-engineer directors. There are, he now asserts, exceptions to every rule. We agree; but it happens that we look at the matter from contrary points of view, with the result that Mr. Lucas's exceptions are found among those constituting what we know to be the true "rule" in this particular matter. However, after the Chairman's final declaration on this subject, it can only be concluded that his former remark was the result of an opinion hastily formed at a time when misfortune harassed. We repeat that it is a satisfaction to find the energy being expended upon the affairs of the Company has already produced promising signs of successful result.

Iron and Steelwork Construction.

This subject has recently been brought into painful prominence by the falling in of a part of the fine roof over the Charing Cross Railway Station—a disaster which resulted in the loss of several lives, and the infliction of injuries more or less serious. This roof was erected more than forty years ago by the well-known Engineer, Mr. John Hawkshaw; and not the slightest suspicion of its safety was ever, so far as is known, entertained. Yet, just as a commencement had been made of re-glazing and painting, and, apparently, without the slightest warning, a tie-rod broke in two, and the supporting wall, forced outwards, fell on to, and demolished, the Avenue Theatre adjoining, which was in course of being rebuilt. Whether anything could have possibly occurred to throw a strain upon the rod which it was incapable of resisting, or whether it was weakened to the danger-point by corrosion, or by some hidden flaw, or fatigue of the metal, are questions which are more easily asked than answered, but upon which it may be expected that some light will be thrown by the investigation which is now proceeding. This much it may be quite safe to say—that if the idea of constructing huge spans such as this one and those at the Cannon Street and St. Pancras Railway Stations had not long since given way to more common-sense practice, this disaster would have put a stop to it, at any rate till the disastrous possibilities which it has revealed had been thoroughly investigated and overcome. It is said, and in all probability rightly, that the Euston Station of the London and North-Western Railway is one of the safest in London, for the reason that it is formed of a number of small-span roofs, so that there is nothing to cause any serious disaster if a failure should unfortunately occur. Happy are the Railway Companies to-day who are in such a case; for assuredly nothing will satisfy either them or the public short of the most rigid examination of all structures similar to that at Charing Cross. At the same time, this task is one of extreme difficulty, and, perhaps, of some danger, since it is not easy to see how the soundness and homogeneity of the metal in the various members of a roof structure can be definitely ascertained. According to external appearances, everything may be right; but in a case like the present, where the tie-rods are stated to be $3\frac{3}{4}$ inches diameter, it is hard to believe that any satisfactory guarantee can be given of the absolute security of the remainder of the structure. This emphasizes the great importance of a rigid inspection of the metal to be used in construction, without which no amount of skill in designing can avail to make a satisfactory job.

For gas-works purposes, there is no particular temptation to indulge in great spans; and perhaps, on the whole, the ideas of gas engineers lean to the side of heaviness, rather than to that of lightness, of design. It is as well that this should be so, having regard to the conditions to which ironwork is exposed on a gas-works. All the same, it is highly desirable that all who may be called upon to design (say) a retort-house roof, should thoroughly understand the principles of construction, so that they may, on the one hand,

properly husband the resources of their employers, and, on the other, secure for the structure a proper margin of safety in regard to every single member of it—bearing in mind the saying that the strongest part of a chain is its weakest link. Much valuable information on this subject was given a few years ago by Mr. A. T. Walmisley, in a paper read at the meeting of the then Gas Institute; and more recently it was dealt with by Mr. S. Cutler, jun., before the Eastern Counties Association of Gas Managers. In Mr. Cutler's paper, the cognate subject of buildings constructed of wrought iron or steel joists was also treated. This method of construction has long been in vogue in various parts of the Continent, though but recently introduced into this country, where, perhaps, the most prominent example at the present time is the extensive range of retort-house and coal-store building in course of construction at the Tottenham Gas-Works. It is one which, under certain conditions, such as unusual height, may be found to possess advantages over walls of solid brickwork; but it is for the engineer to see and determine for himself, in his particular circumstances, whether or not novelty is its sole or its chief recommendation.

Stamp Duty on Corporation Fund Investments.

THE payment of stamp duty on the conversion of stock is a question that has been immutably settled as far as gas companies are concerned; but the matter in another shape has come to the front in connection with the investment of sinking and reserve funds by local authorities in their own stock. The question is one in which a considerable proportion of our readers are interested. It was the Hull Corporation who joined issue with the Inland Revenue over a claim for stamp duty on two sums of Corporation stock—£112,525 and £119,439 respectively; and they have anyway done a service by securing a definite decision from the authorities on the subject. The first-named amount was created last year; and the latter early in the present year—in both cases the stock being issued and utilized by the Corporation for the investment of sinking and reserve funds. The Inland Revenue held that this was an issue of loan capital within the meaning of section 8 of the Finance Act, 1899, and that the ordinary duty of 2s. 6d. per cent. was payable upon it. Of course, it would be wrong for us to try to pry into the recesses of the past, to see how it came about that the Inland Revenue, when a similar issue was made in 1900, did not require any duty to be paid for the reason that the stock was being used for investment purposes by the Corporation; and it would, it is supposed, be presumption for us to question how it is that a claim that is held to be correct now was incorrect then. The Inland Revenue are, it has been found before, quite proof against criticism; but it is not an agreeable thing to find that they also claim what has been regarded as the exclusive prerogative of the fair sex—the privilege of changing their minds, without explanation, as often as they choose. A Sub-Committee of the Hull Corporation had a personal interview with the authorities at Somerset House, and urged that, in view of the Board's decision in 1900, the present claim should not be pressed. As a result, the Board have effected a compromise by abandoning the claim to duty on the stock issued in 1904 for the purpose of investment by the Corporation, but they abide by their claim for stamp duty on stock issued this year, and will maintain their right to it on issues for similar purposes in the future. This being so, it will not do for Corporations to hope to get a rebate of duty, as Hull has done, by pleading that they acted in the full belief that the Inland Revenue is an impeccant body, and that past ruling could not therefore be a mistake.

Rejection of the Paris Municipal Gas Bill.

IT will be seen from the report which appears in another column that for the second time the French Senate has come into conflict with the Chamber of Deputies over the question of the gas supply of Paris. It may be remembered that in October last year the Chamber passed a Bill sanctioning a loan of 120,000,000 frs. (£4,800,000) for the acquisition of the works and plant remaining in the possession of the Gas Company on the termination of their concession at the end of the present month, and the carrying on of the service by the Municipal Council. When the Bill came before the Senate early this year, it was rejected—or, rather, the portion providing for the municipalization of the undertaking was struck out, and the amount of the loan was reduced to 100,000,000 frs. The Bill in its altered form went back to the Chamber, and was amended in certain particulars which it was thought would satisfy the Senate; but when it was brought up again at the end of October last, the principle to which that House had taken exception had been embodied in it. After a discussion extending over several days, the preamble was passed on the 10th ult. by 294 votes to 264—a majority of 30—and a few days later the Bill was sent to the Senate. The outcome of its consideration in that Chamber was its rejection on Thursday by 153 votes to 125—a majority of 28. The result was not altogether surprising to those who had followed this important question through its various phases. The more closely it was studied, the more evident it became to many that municipal control of the gas supply, whatever advantages it might have been found to possess in other countries, was not advisable for the Metropolis of France. Evidence of a change of view among the deputies was afforded by the voting on the preamble of the second Bill; the majority having dropped by 153. This was very naturally accepted as a proof that no fresh arguments had been brought forward in the course of the debate which would be likely to induce the Senate to depart from the course taken by them on the previous Bill; and they not only did not do so, but they actually maintained their attitude with an addition of seven supporters. The effect of the decision is to place Paris in a position unexampled in the history of its gas supply—indeed, we think we may say in that of every other large city. In twelve days the Gas Company's concession will expire; and, so far as we are aware, no negotiations have been entered into with them either for its renewal or for ensuring a continuance of the service in the area controlled by the Municipality, though the suburbs have been provided for. Indeed, the affairs of the Company are in the hands of the liquidators. Doubtless terms can be made with them; and, seeing that the matter has reached a highly critical stage, the sooner this is done the better.

Professor Boys' New Gas Calorimeter.

In last week's "JOURNAL" was published a short description of a new gas calorimeter that has been devised by Professor C. V. Boys, one of the Metropolitan Gas Referees; and we are enabled this week, through the kindness of the Royal Society, to publish the paper that he has presented to them, in which the new instrument is described and illustrated in full detail. Readers of the "JOURNAL" will greatly appreciate the courtesy which allows us to place before them early information of the instrument that is—certain paragraphs in the paper lead to the conclusion—destined to be the one adopted for the testing for calorific power (not for penalties) of the gas supplied in London as decreed by the London Gas Act of last session, which also imposes on the Referees the duty of prescribing the instrument and mode of testing. Upon the instrument described, a study of the drawings and details show, Professor Boys has exercised considerable ingenuity, and has aimed at attaining the requisite perfection to ensure the ultimate degree of accuracy. Whether he has attained this will be better seen when different instruments, made to the one specification, and worked to the instructions laid down, get into the hands of different observers outside the office of the Referees. We entertain no doubt as to Professor Boys having succeeded, in view of the fact that he has had considerable experience in calorimetry as well as with practically all known, or rather all workable, forms of calorimeter. He has knowledge, therefore, of their weaknesses or of their deficiencies and unsuitability for prescription as standard instruments; and the disadvantages found in them he has sought to avoid in the new instrument. An important matter for a standard instrument of this kind is that, to ensure constancy, it should be capable of being taken entirely to pieces quickly and without trouble; and capability in this respect is one of the peculiarities of the new calorimeter. This brief reference will be sufficient to specially direct attention to the paper, which it is a pleasure to be in a position to reprint in other columns.

Important Report on the Public Lighting of Edinburgh.

In subsequent "JOURNAL" pages to-day is published a far-reaching report on the public lighting of Edinburgh by Mr. J. F. Simmance, Assoc.M.Inst.C.E., in compliance with the reference to him by the City Council. At the time of going to press, the

report has not been discussed by the Council, but it is in the hands of the members; and therefore it would be inappropriate to comment upon its contents, other than in the most general way. The report must be deemed by both the officials of the Gas and Electricity Undertakings to be eminently satisfactory to their respective departments, though we can imagine that, as unjustified complaint regarding the illuminating power of the gas from the Granton works originated the investigation, the result is not to the satisfaction of the complainers or to electrical partizans. Mr. Simmance's inquiry was a wide one; and the scrupulous care that he took to render justice, by his methods and by the completeness of his scheme of procedure, is disclosed by the painstaking manner in which everything is set out in the report, and which raises the document above all suspicion of any preferential treatment. In Edinburgh, a gas of higher candle power than southerners are accustomed to, is supplied; and in view of this the report abounds in technical interest on many points—for example, the small amount of depreciation in travel of the high-grade coal gas, the illuminating power and consumption of incandescent burners using this high-power gas, the calorific power of the gas, mantle maintenance, and so forth. It may be taken for granted that one effect of Mr. Simmance's report will be to improve illumination by the incandescent gas-lamps through the ready means suggested by him. The maintenance of many of the mantled lamps, according to the report, is not good; but the remedy is simple. In regard to the original cause of Mr. Simmance's investigation—the complaint as to the gas supply—it is shown to be, by his precise investigation, altogether groundless.

Properly Fencing Off an Excavation.

Mr. Justice Darling is remarkable for his jokes, even at a time when witticisms on the part of Judges and Police Court Magistrates are anything but uncommon. At Leeds, a few days ago, during the holding of the West Riding Assizes, a case was tried which afforded ample opportunity for humour; and Mr. Justice Darling, it will be easily understood, did not fail to take full advantage of the chances as they presented themselves. In the report which appears in another part of to-day's issue, we have, of course, been compelled to confine attention to simple details; but as a matter of fact, the evidence was punctuated at frequent intervals with laughter, which must have done much to relieve the tedium of the legal arguments. The case was one in which the Sheffield United Gaslight Company were proceeded against to recover damages for personal injuries alleged to have been caused by their negligence. In a word, they had made an excavation, into which the plaintiff, a Sheffield tradesman, fell headlong while proceeding home one night. The hole was roped round; this was admitted. But the plaintiff denied that he saw any lights to warn people of the danger; while, on behalf of the Company, a considerable amount of evidence was given to show that there were lamps on the spot. This was important, as, of course, everything hinged on whether the excavation was "reasonably guarded." The Company maintained that all reasonable care had been exercised by them; and yet the plaintiff fell into the hole. How was this? Because, they said, he had "deprived himself of his senses." In this connection, it is to be noted that the plaintiff admitted having, after confining himself to ginger ale all day, had two or three gins in the evening, "to ease the pain" in his back, from which he was suffering. This led Mr. Justice Darling to inquire innocently how he applied the spirit. Contradictory evidence was given on the point of whether or not the plaintiff was drunk; but the Judge, in summing up, said he was not fit to walk home, though not incapable. He pointed out that the Company were not bound to guard a hole in such a way as to exclude from it a man so drunk as to be unable to see a light when it was there; and that "it would be perfectly intolerable if public bodies doing necessary public work had to take means to safeguard people who could not take care of themselves because, of their own voluntary act, they had rendered themselves incapable." It certainly would. As already remarked, it was admitted that the excavation was roped (though plaintiff asserted that the rope was loose); and the Judge said he thought the evidence went to show there were lamps there. In addition to all this, the Gas Company's foreman gave evidence that there were battens on the inner side of the rope. It is gratifying to find that, by their verdict for defendants, the Jury indicated that they regarded this as "properly fencing off the excavation."

The Complaints of the Gas Supply at Nottingham.

Complaint has in recent times been rife at Nottingham regarding a phenomenal condition of the gas supply—spasmodically wide variation in illuminating quality and pressure creating much dissatisfaction. The Gas Committee and their Engineer (Mr. J. H. Brown) were satisfied as to the complaints being legitimate and not due merely to petulance; but the *locale* of complaint was so capricious and the cause so temporary that the whole thing was for a time enshrouded in mystery. Every attempt at solution failed; at every turn fresh attempt was frustrated. The situation was rendered the more difficult by the fact that the city is supplied by three works, and constitutes, we are under the impression, one area. If this is so, then it was impossible at any one time to say from which works any one portion of the district was being supplied. The anxiety of the Committee and of their Engineer to get to the bottom of the bewildering state of things which confronted them led to the determination to call in outside aid to fathom the matter; but now it appears, from veiled and somewhat sensationally framed statements in the local Press, that this will not now be necessary. Reading between the lines, it appears that certain irregularities have been proceeding at one of the stations, and that certain of the minor officials are implicated in them. Nothing can yet be definitely stated; but if the above surmise is true, the explanation of the mystery may resolve itself into an employment by those concerned at the station in question, of well-known expedients for inflating the make whenever opportune, and forcing the impoverished gas into the district when there was little chance of discovery. In good time the truth will be known; as well as the reason for the irregularities. But anyway the paragraphs in the local papers are sufficiently explicit to show that a discovery of some importance has been made, and that there is hope that the Committee and Mr. Brown are at the end of their worry so far as the supply to the district is concerned. Whatever the cause, the failure of first efforts at discovery may have emboldened those who were unfaithful to the trust placed in them, and so led to their undoing. We can sympathize with the Committee and their Engineer (who, as events have shown, has won for himself the fullest confidence of his Committee), and congratulate them upon having probed the secret of the mischief.

The Mond Gas Business.

The "Financial Times," in commenting, under the heading of "Mond Gas Progress," on the report for the past year of the Power Gas Corporation, says it shows that the Company have practically been marking time during the last twelve months; circumstances having apparently not been very favourable to some of the undertakings in which they are interested, and income from these sources has either declined or temporarily stopped. As a consequence, the profits amount to only £2000, as compared with £8600 in the preceding period. There was an amount of £2000 brought into the accounts; and, according to our contemporary's Sheffield correspondent, the Directors' fees and commission will be £1196. Of the balance, it is proposed to write off preliminary expenses £1081, and to carry £1688 forward. The South Staffordshire Mond Gas Company's station is now in regular operation; while in other districts several large orders are in progress, and a number of important schemes are under negotiation for the adoption of the Corporation's patent process. It is stated that Mr. Alfred Ward has been elected Chairman, in place of Sir Henry Fowler. The "Financial Times" concludes its remarks upon the report in the following terms: "It would be unfair to criticize too hardly an undertaking with a new process during its initial years; but considering the expectations created by the starting of the Company, it is disappointing to the shareholders to see the profits keep going down instead of rising. The prospects for the current period, however, seem really hopeful. We notice that the Directors, who have always acted reasonably in the matter of fees, propose an amendment of the Articles of Association which will make the greater part of their income in future dependent on the rate of profit earned." The shareholders, it will be noticed, are to get no dividend on the present occasion; whereas last year they received 3½ per cent. on the ordinary shares, and the year before that 5 per cent. (less income-tax).

THE DERBY NAPHTHALENE PROCESS AT SHEFFIELD AND AT HOME.

In connection with the work which has been proceeding in different quarters, aiming at the desirable end of achieving positive and constant relief from the naphthalene difficulty, the charge of prejudice and ungenerous treatment has been freely brought against us. We have disclaimed prejudice and all else other than a desire to keep readers fully informed of what is happening, and of the successes realized. In pursuance of this, as we conceive it to be praiseworthy desire, it gives us the utmost gratification to call attention to the handsome acknowledgment that has been made by the Board of the Sheffield United Gas Company, through their General Manager (Mr. Hanbury Thomas), of the success in that city of the "Derby" naphthalene process, which has been in use at the Grimesthorpe and Neepsend works —the two largest stations—of the Company since April last. In their quest for relief, the Sheffield Company and their Engineer (Mr. J. W. Morrison) have been experimenting with various oil-washing systems for some time past. They have not spared expense in their endeavour to effect a cure of the deposition, with all its annoying, laborious, and expensive consequences; and, in addition to the employment of Mr. J. Ferguson Bell's process at the works already named, they have under trial at the present time at the third works Mr. Colson's solvent. From the letter that Mr. Hanbury Thomas has just addressed to Mr. Bell, it is gathered that, although naphthalene has not been altogether absent in the districts supplied with gas from these works, a much greater freedom from complaints has been experienced than has been the case for many years. This improvement, it is felt by the Directors, is largely owing to the remedy suggested by Mr. Bell. But the venerable Chairman of the Board (Sir Frederick Mappin, M.P.) and his colleagues do not stop at words; they supplement them with a substantial present in the form of a cheque as an acknowledgment of Mr. Bell's work upon this difficult problem, and for placing the results of his exertions at the disposal of the Company, and rendering assistance in the working of the system. It must be eminently gratifying to Mr. Bell to have this independent testimony of success, confirmed as it is in such liberal and tangible manner. We cannot help regarding the action of the Board of the Sheffield Company from a broader point of view; for this is the kind of recognition that does much to encourage investigation and invention and its application. The recipient of this acknowledgment in the present instance has our warmest congratulations.

It is now some four years that Mr. Bell has been working on the naphthalene problem; and prior to that (as he has shown in his published experiences) other methods have been tried by him at Derby, and had been unsuccessful. We have at hand a return from Derby for the past three months, and for the same period in 1901. It will be seen from this that complaints fell from 4678 in the three months of 1901 to 31 in the corresponding past three months, with a larger number of consumers. Comment on this happy position would be superfluous.

Statement of Total Complaints attributed to Naphthalene during the last Three Months and for the Corresponding Period in 1901, *before the introduction of the Derby Process.*

	1901.		1905.
September	1658	..	12
October	1677	..	3
November	1343	..	16
Total	4678	..	31

The consumers supplied by the Company number 23,800; and the process has been at work now for three years. It has therefore received at Derby a very complete trial.

FROM GAS TO ELECTRICITY AT SUTTON.

We have been asked by the "Electrical Review" to note that the Sutton District Council have resolved to displace some 196 incandescent gas-lamps by electricity. We have done so; and at the same time have also noted that the District Council in question have come to the determination to do this at the sacrifice of the ratepayers' money, on an estimate of candle power that is on its very face ridiculous, by the agreement to adopt a type of electric lamp that electricians have frequently declared to be unsuitable (for instance, at the Edinburgh meeting of the Municipal Electrical Association) for street lighting, by denying the Gas Company the privilege of tendering for a five years' contract as granted to the Electricity Company, and at the sacrifice of lighting efficiency in the streets concerned. These are serious points, and points the District Council and ratepayers should have brought to their attention. In the first place, the number of incandescent gas-lamps it is proposed to depose is 196; and from what we know of Sutton, there are certainly somewhere between 300 and 400 incandescent gas-lamps still remaining. These lamps it is proposed to supplant by a flame or other type of arc light opposite the railway station and at the Cock Hotel, two Nernst or other incandescent electric lamps of 132-candle power in the High Street, and 168 Nernst or other lamps for the side streets. Such a scheme of lighting is altogether contrary to reliable experience elsewhere on the matter of efficiency in street illumination; and, if persisted in, we can foresee regret on the part of the District Council, which regret the inefficiency will provoke the ratepayers to keep constantly alive. We fail to see that the "Electrical Review" has anything to chuckle over in connection with such a scheme as this, which the District Council have, it is plain, accepted without due consideration.

We will deal with the financial question first. There appears to be something wrong about the figures supplied in the report published in the local papers, and which has been copied by our contemporary. There is either a deficiency of information, or the Electric Supply Company are overcharging the District Council. We have mentioned that two arc lamps are to be used, the charge for which is to be £17 each (or £34 the two); and 168 Nernst or other incandescent electric lamps, which are priced at £3 12s. 6d. each (or £609). What the two 132-candle Nernst or other lamps in the High Street are to be charged at, the report does not inform us. But as £609 and £34 make £643; and, as the total charge for the electric lighting is to be £737 5s., there is apparently £94 5s. remaining for division between the two 132-candle power incandescent lamps! If there is an explanation as to this £94 5s., we shall be glad to have it. We do not think that we have made a mistake, as the report speaks of 14,500-candle power being obtained for £703 5s., and £34 is the difference for the arc lamps between that sum and the total charge; so that the £703 5s. is entirely for Nernst or other incandescent lamps. Then, pursuing the financial investigation, we have to compare the £3 12s. 6d. with the offer of the Gas Company. The Electric Light Company have obtained a five years' contract. The privilege of tendering simultaneously for a five years' contract (as we have before said) was not vouchsafed the Gas Company; and it ought to have been, as they were invited to tender. Had they been allowed to so tender, or had it even been suggested they should so tender, they would have been prepared to have offered to supply at £3 10s. per lamp for five years, as they are going to do, now they know that five years' contracts are acceptable, for the remainder of the gas-lamps. As it is, their offer for a three years' contract, before they knew of the five years' concession to the Electricity Company, was £3 12s., which is 6d. per lamp less than the Electric Company's tender; and therefore the Council have not accepted, even on the Gas Company's three-years' basis, the lowest tender, but have bound the town for five years to a system of illumination about which they know little or nothing, and have blindly taken as truth estimates of illuminating power that very brief experience will show them have been computed on a scale of imaginative ingenuity that has its effect upon laymen who are unable to question the figures. The Gas Company's price for a year's contract was £3 14s. per lamp. And all these prices were for 3630 hours' lighting per annum, including gas, the whole of the maintenance of the lanterns, burners, nine mantles per lamp per annum, the lighting, extinguishing, and cleaning, and the painting of lanterns and columns once a year, and cleaning the lamps once in seven days. And we hold that this was generous treatment; and with the high average of nine mantles per lamp per annum, the lamps must have been sustained in a state of excellent efficiency. We have shown therefore that, in the matter of price, the Council are paying the Electric Company more per lamp (not mentioning the £17 per arc and the mysterious £94 5s.), and that they have, as is not infrequently the case, in turning from the old love to the new, not held the scales of justice evenly between them by also asking a price from the former for a five years' contract, which would have been at £3 10s. per lamp—a saving of 2s. 6d. per lamp per year on the 168 lamps for five years! On the five years contract, the Council are going to pay the Electricity Company £255 more than it would, for a similar period, have been possible to secure more efficient lighting for from the Gas Company.

The value-for-money question is an important one; and here again there is an under-estimate for the gas, and, on experience at other places, we claim an over-estimate for electricity. It has been proved over and over again that, in comparison with incandescent gas lighting, incandescent electric lighting is no good whatever for street purposes. In this case, the Council will have fewer points of lighting, seeing that 196 lamps are going to be displaced by 172; and high authorities on street lighting and even many electricians admit that, the more frequent the points of illumination—provided the points are something better than rushlights—the greater the uniformity of the illumination. Even the Sutton town councillors must see this. The incandescent gas-lamps at Sutton are No. 4 Kerns and ordinary "C" burners. We do not know how many of each type are going to be displaced; but it may be taken (using nine mantles per annum per lamp, and cleaning every week) that, with the burners named, a maintainable illuminating power of 12,000 candles will be realized by the 196 lamps. Well now the electricians state that they are going to give the Sutton people a total illuminating power of 17,586 candles. Are they? Of this 14,500 candles are credited to the Nernst or other incandescent lamps, so that we have 1543 candles left for each of the two flame (or other) arc lamps. The last figure is humorous enough, but the 14,500 candles are even more so. We deduct 264 candles for the two special Nernst or other incandescent lamps, and have 14,236 for division between the 168 lamps, which gives about 85 candles per Nernst lamp. We can dismiss the "other" incandescent lamps, as we do not

know of one applicable for street lighting that gives 85 candles. But the Nernst lamp is another matter; and no tests have come before us in which that figure is shown. On the contrary, the highest we remember for Nernst lamps has been 75 candles; but at the Edinburgh meeting of the Municipal Electrical Association, one speaker stated that he got from the reputed 75-candle Nernst lamps about 40-candle power, and even as low as 20 when the globes got dirty. Mr. Fedden, the Corporation Engineer of Sheffield, too, mentioned (with other speakers) some shocking differences that he had obtained between the actual and reputed candle powers of these Nernst lamps; and rapid depreciation of the lamps was also freely spoken of. Canvass the electricians of the country, and Mr. Fedden will not be found occupying any "lonely furrow." The "Electrical Review" itself not long since gave the illuminating power of a new Nernst lamp at 70 candles, and admitted that in use the illuminating power declined. On the other hand, incandescent gas-mantles are renewed at Sutton nine times a year, without extra cost to the ratepayers; so that efficiency is guaranteed. Experiments have also been tried at Edinburgh with Nernst lamps; and the Convener of the Cleansing and Lighting Committee the other day held that the "Nernst lamps had not been a success." The Electric Lighting Committee contended that they had been. Of the two, the Convener of the Cleansing and Lighting Committee is clearly the more disinterested.

In the face of accumulated evidence, how can the 14,500-candle power referred to in the Sutton report possibly be justified as a maintainable total? It is much too high to start with when all is new; it is nothing like the figure that will be obtained when less than a fourth of the lighting hours of a year have been spent. That we positively assert. On the strength of these statements, the Sutton District Council ought to show that they have safeguarded the interests of the ratepayers, and that they are satisfied that their wisdom has been sufficient to penetrate the accuracy (and the perpetuation of the accuracy) of the figures upon which they have been induced to turn from a certain system of lighting to one the uncertainty of which has been proclaimed by more experienced men than themselves.

ELECTRIC LIGHTING MEMORANDA.

London Power Bills—Evasiveness and Facts regarding Public Lighting—Frugal Information from Sleaford—Success of Wisdom at Boston (Lincs.).

THERE is a noticeable quietness about the promoters of the Bill of the Administrative County of London Electric Supply Company. In preparation for their parliamentary campaign, they had this time last year commenced their trumpetings in the Press; but this year so far there is silence. The promoters are perhaps quietly taking stock of the strength of the opposition, as well as entrenching themselves by making private agreements with those whose custom they will desire, if their measure succeeds. But while the Administrative Company are "lying low," the Additional Electric Power Supply Company are imitating their tactics of a year ago, and are interesting the Daily Press in their St. Neots scheme, which it must be said is receiving very substantial backing in financial quarters. The intervention of a scheme from Spring Gardens, however (which was at one time looked upon with amusement and complacency), has dulled the outlook for these measures. It was all very well to regard the County Council measure lightly while a Conservative Government was in power; a Liberal Government, with Mr. John Burns at the Local Government Board, and Mr. Lloyd George at the Board of Trade, supplies an inversion of circumstances favourable to the Council. At the same time, it is to be hoped that a Liberal Government will not allow London to be committed to a hypothetical scheme such as that of the County Council. There is nothing defined or positive about it; and it is, as has been well put by more than one discerning member of the Council, a complete "leap in the dark." The Council on Tuesday last agreed, by 66 votes to 38, to proceed with the promotion of the measure; but faith has been broken both with the public and the opposing members. When the matter was formerly before the Council, consent was given to the preliminary stages of the Bill being pursued on the strict understanding only that a complete scheme and financial estimates should be placed before the Council prior to any definite resolution being passed. Neither engagement has been fulfilled. Fear and uncertainty of the one or the other not standing an analytical investigation restrained. But every test that it is possible to apply to the position strengthens the opinion that, if the Council Bill succeeds, there is in connection with this scheme considerable loss in store for the ratepayers. The day is past when the Council can claim any monopoly; and electricity will have to be sold at a fine-drawn price for competitive purposes. A huge capital expenditure, running into millions, will be involved, upon which there will be heavy standing charges. While the Council, too, are giving thought to the present, the promoters of other Bills take thought for the future, and are making satisfactory agreements with established undertakings for the supply in bulk of their requirements beyond existing capacity. There are among the Borough Councils those who are looking very approvingly upon the St. Neots scheme. If, however, the General Election puts into power a Liberal Government, the prospects of the County Council Bill going through will be much improved; while the prospects of the scheme it involves being anything but disadvantageous to the ratepayers of London becomes, the closer the view, the more obscure.

Contemporary evasiveness on the matter of public lighting by electricity and high-power and other forms of incandescent gas-lamps calls for strict watchfulness. Categorical statement on the subject is not to the liking of our journalistic friends of the electrical industry. If only it were, it would put a little more life into the controversy. They confound argument with persistence in indefinite depreciatory statement concerning gas lighting, and lofty talk of what electric lighting can do, or will do in the future. "In the future!" There is a familiar ring about the words; and it is readily associated with a phrase that was common enough in the mouths of electricians twenty years ago. Gas is still in the streets of London; and additional gas-lamps are being put up in the City, and a number of electric ones are under notice to quit. "These continual changes," says one electrical contemporary, "are expensive;" but we suggest not so expensive as arc lamps at £26 apiece, or arc lamps at half that price which must be fairly close together to get anything like uniformity of surface illumination, instead of spotted brilliance. As we write these lines, London is wrapped in dense fog; and down at Blackfriars Bridge Approach through the fog have just been seen four well-defined spherical patches of light, wearing a very far-off look, and exerting none of that quality of "mutual influence" which was attributed to them when they were the subject of Mr. Bailey's celebrated photometrical tests. Those are the flame arc lamps; and when most wanted, their glory is obscured. We hope that the corporators of the City have been making observations. Along the Strand, and westward, too, the Westminster City Council's oil-flares are affording assistance to the high-placed electric arcs. Turning from the befogged streets to the pages of our electrical contemporaries again, the high-pressure gas lighting at the entrance gates, and on the front railings of Buckingham Palace, which has been ignored by them, has now been noticed. Someone has been writing to the Editors of the "Electrical Review," asking what are the "real facts" as to certain statements [made by the "Daily Mirror" as to that example of high-pressure lighting illustrating the "immense superiority of gas over electricity." The Editors tell their correspondent that it is amusing to read these things [we doubt it], and advise that the Editors of the Daily Press who insert such paragraphs should go and see for themselves whether the statements they father are true. They talk, too, of "misrepresentation;" but they do not give their correspondent the "real facts" for which he asked. If he happens to be a reader of the "JOURNAL," we suggest to him that he should adopt the advice the Editors of the "Review" have given to their colleagues of the Daily Press, and, instead of wasting time writing letters to no purpose, that he should take a walk along the Mall to the precincts of Buckingham Palace, and judge for himself as to how far (if at all) the daily paper strayed from the truth. If the correspondent is a diligent reader of the "Review," in the same issue he will have found some real facts. He will have seen that, at a recent meeting of the Hammersmith Borough Council, "there were many complaints about the quality of the lights in the streets and private houses;" and that the Electrical Engineer stated that the Council only undertook to supply "electricity and not light." Sapient and truthful engineer! It will hardly, too, have escaped the notice of the correspondent that the same issue of our contemporary reports that "dissatisfaction has been expressed at Malton as to the lighting of the town," and that the Local Government Board advise the Torquay Corporation to postpone any extensions of the system of public lighting by electricity on the ground that it is unremunerative. These are "real facts."

The Sleaford District Council mastered early in the career of their electric lighting undertaking the art of economical publication in the matter of its finances; and to this fact is to be attributed a recent misunderstanding in the town over a little piece of book-keeping that, on the first blush, turned a much-cherished though modest balance in favour of the undertaking into a loss. There is a sum of £320 odd which has been conveniently standing to capital suspense account; and the District Auditor insists that this sum should not be allowed to remain stationary any longer, but should be dealt with, either by charging it to the general district rate or else to the revenue of the undertaking. Things are cut so fine at Sleaford that there is a balance of profit appearing on the net revenue account of £268 17s. 5d.; so that, if the £320 were charged to revenue, the undertaking would revert to the *status quo* of deficit. If the sum goes to the general district rate, the ratepayers will recognize that, in addition to costly and ineffective public lighting, this is an additional burden laid upon them in support of the electricity scheme of the District Council. The sum appears to be for "lamps, &c.;" but nevertheless it is unfair for this to come as a charge upon the ratepayers, inasmuch as the expenditure has distinctly been made to benefit the electricity concern. However, the rates are (if we have succeeded in penetrating the clouds that surround the matter) destined to have to bear the charge, in order that consumers of electricity may benefit. The ratepayers who are not electricity consumers should note this. Well, now, it may be asserted, with little fear of disproof, that if the electricity undertaking was charged with all the expenses for which it is responsible, the balance which the Council proudly show on the working would be reduced to the

shadow of its present modest size, or would be absolutely wiped away. Even Mr. Hubbard, a leading member of the Electric Lighting Committee, confesses to finding it difficult to understand the electric lighting accounts as published; and that is not surprising. The Electric Lighting Committee do not give full details of their financial workings; if they did, there would, it is feared, be some misgivings as to whether there is any tangible representation of profit standing to the credit of the concern. There was a balance on net revenue account brought forward from 1904 of £204 15s.; and on the net revenue account for the last financial year there is a profit-balance of £268 17s. 5d. But let not the ratepayers be deluded, by the manner of presenting the accounts, into thinking that this £268 is the net profit on the past year's working. It is not so. From it has to be deducted the sum of £204 15s. brought forward; so that the net "profit" amounts to the magnificent sum of £64 on the capital of £10,355. Also let it not be overlooked that the £268 includes £217 sundry debtors; and whether this £217 is all good no one knows.

For assistance in interpreting these Sleaford accounts, we turn to the figures for 1903-4 in one of the recognized sources of information; and there we find the economy of particulars again exemplified, by the grouping together of the whole of the working expenses—coal, stores, wages, repairs and maintenance, public lighting, rents, rates, and taxes, and management—in the one magnificent sum of £487; so that there are no means of making a critical examination of the items. Are the Committee afraid of critical examination that more detail is not afforded? We assert, if the details were given, they would without doubt show that the net profit of the year 1903-4 was (as was that for the past year) only exhibited by the favourite process, adopted by municipal concerns, of "pinching," and charging expenses fairly payable by the electricity concern to other of the town accounts. The sum of £487 is really too absurd. We should like to know something about the rating of the concern on which over £10,000 has been spent; something about the amount paid the Engineer; the proportion of charge for clerical and office expenses; the sum spent on repairs and maintenance; and so on. The accounts look as though the Electric Lighting Committee have solved the problem of how to get a quart into a pint-bottle; and it would be interesting to the ratepayers and to us to learn how it is done. For an analysis of the £487 would assuredly show some interesting deficiences in the charges against the concern. In the same accounts, receipts from public and private lighting are lumped together. The last issued accounts as published in a local paper throw no light on the matter; for in the general statement of receipts and payments, we find under receipts "electric lighting, £680 17s. 11d.;" and under payments "electric lighting, £446 5s. 8d.; and public lighting, £450." What does it all mean? It is time the ratepayers refused to be lulled into a state of contentment by such secret methods of account-keeping, and should ask their representatives for full details. We are thinking there would be a little revelation as to this "profit"-producing concern. It must be remembered by the ratepayers that all the relief given to the electric lighting undertaking comes upon them; and it is always well in such things to know clearly where one stands, and the extent of one's support. It is obvious, too, that the Committee are not acting any too liberally in the matter of repayments on capital account; and it would afford interest to know the period or periods of repayment, and whether, in connection with this matter, it is not thought advisable, having spent more than £10,000 on the electric lighting works in Sleaford, to let the ratepayers know the views of the Committee on such questions as reserve and depreciation funds.

The Boston (Lincs.) Corporation have, after gyrating for many years round the question of a municipal electricity supply, decided, by fourteen votes to six, to leave to private enterprise the risk of furnishing the town with electricity. It is a sensible decision; seeing that the last time the Council tried to get the means for giving effect to their Provisional Order, the Local Government Board as good as told them that it would be far safer to leave electricity supply severely alone, and as if to enforce submission to their views did not sanction the necessary loan. Under the circumstances, it was rather cruel of the Board of Trade to write to the Corporation the other week to tell them that, as they had not carried out the obligations devolving upon them in the matter of executing the scheduled works under the Order (which, as a mater of fact, ought to have been completed by June 25, 1902), it would be the duty of the Board to determine whether the Order should be allowed to remain any longer in force. The Paving and Lighting Committee, at the meeting of the Council the other day, attempted one more struggle to save the Order; but it produced a total collapse for their aspirations. Glibly talked the Chairman of the profits that other towns, having totally different characteristics from Boston in regard to size, industries, population, and so forth, had made after incurring losses for four, five, six, or more years. But in most cases the profits were of such a nature that it would have been better had the authorities concerned borrowed the money and (if such a thing were allowed) put it into some industrial security other than electricity. It would anyway have been more advantageous to the ratepayers. Boston has no factories worth speaking of, the Lighting Committee were contemplating only a limited amount of public lighting by electricity, and there was no guarantee that the private consumers were anxious to adopt a form of lighting dearer than that they already possess.

THE GAS STOCK AND SHARE MARKET.

(For Stock and Share List, see p. 843.)

THE week just closed brought about no improvement in the general tone of things on the Stock Exchange. Business was quiet, and prices for the most part were weaker, though at times a slight tendency to mend showed itself. After the conclusion of the account, markets became very inactive and dull, and realizations towards the close were pronounced. This feature was largely owing to the state of the Money Market, and to the approach of the Christmas holidays; and it can scarcely be expected that there will be any revival till the turn of the year. The Money Market had an agitated week. The extraordinary abundance in the market was becoming almost embarrassing, when the Bank of England stepped in on Thursday and took it off. The effect of this was to set the current almost too sharply in the other direction; and at the close, rates were decidedly stiff. Business in the Gas Market was very fair, perhaps about equal in the aggregate to the volume of the preceding week. The tendency was firm and steady in general; and there were very few changes in quotations. The feature of the week was the strength of Gaslight and Coke ordinary, possibly owing, in some measure, to the dark and foggy weather. The market is very fond of a fog as a bull point; it has a notion that a good fog is a little gold mine to a gas company. Anyhow, the ordinary was brisk and buoyant, and rose from 101¾ to 103¼, with an advance of a point in the quotation. In the secured issues, the maximum was done at 90½; the preference was half-a-point better at 112, after a special bargain had been done at 110½; and the debenture marked 88¼ *cum div.* and 86½ *ex div.*, with a rise of a point in the quotations. South Metropolitan was quieter, and indisposed to move; transactions never ranging outside the limits of 132½ and 133½. In Commercials, there were dealings in the 4 per cent. at 117¼; in the 3¾ per cent. at 113¼; and in the debenture at 86 *ex div.*, after a small amount had been marked free at 85¾. The Suburban and Provincial group exhibited their usual quiescent attitude, and showed no movement. Bournemouth "B" was done specially at 17½, Brighton and Hove original at 223½, British at from 42⅜ to 43¼, and Bromley "A" at 120½ and 122½. On the local Exchange, Newcastle had a fractional advance. The Continental Companies were fairly active. Imperial receded a little after its recent sharp advance. Transactions were marked from 235 down to 232½; the quotation losing a point-and-a-half. Union was done at 129 and 130 *cum div.*, and from 125½ to 126½ *ex div.*; while the preference marked 145 *ex div.* European was done at 22¾. Among the undertakings in the remoter world, business was decidedly quieter, and there were no changes in price. Cape Town preference was done at $10\frac{7}{16}$, Buenos Ayres at $12\frac{9}{16}$, River Plate at 13, Primitiva ordinary at from $7\frac{1}{16}$ to $7\frac{3}{16}$, ditto preference at from 5¼ to $5\frac{5}{16}$, and ditto debenture at 97 and 98¼.

The closing prices are shown in our Stock and Share List on page 843.

From Early Volumes of the "Journal"—July 11, 1853.

The New Electric Gas.—In another part of our columns will be found brief extracts of the recent patent of Mr. E. Clarence Shepherd for making gas. This patent has excited no little interest among scientific men, in consequence of the novelty of its pretended power to generate, by the decomposition of water under the influence of the magneto-electric machine, a gas, or combination of gases, of an inexplosive nature. That this feat was actually achieved we know upon good authority; and the only question which required elucidation was the cost of the process—a subject dealt with by the inventor in a very loose manner, and got over by a general assertion that the gas in its production cost 3d. per 1000 feet. As the material actually employed was kept a profound secret, it was impossible either to prove or disprove this statement, though we certainly had our suspicions. As, however, speculators in patents, like speculators in "horse-flesh," have always their "settling-day," we quietly awaited the *dénouement*, and at last had the satisfaction of unrolling Mr. Shepherd's secret; and what did we find? Why, that the 3d. per 1000 feet gas results from the oxidation of oxalic acid, and would cost, in reality, not that sum, but as under, upon the supposition that magnets cost nothing, helices of covered copper wire cost nothing, steam-engines cost nothing, fuel cost nothing, labour cost nothing, and the best Scotch naphtha can be had delivered on the works for nothing! Nay, it must even be supposed that a gas containing 50 per cent. of carbonic acid can be purified for nothing. When oxalic acid and water are subjected to the action of an electric current, the water is decomposed, its oxygen passing to the oxalic acid to form carbonic acid, while its hydrogen is set free. Of course, such a mixture is inexplosive, and, when naphthalized, will burn like common gas. Now, 63 parts by weight of pure oxalic acid will, in this way, generate 1 of hydrogen; and as a cubic foot of hydrogen weighs about 40 grains, it would require 63 × 40, or 2520 grains of oxalic acid for its production. But, if 1 foot requires 2520, then 1000 feet will take 2,520,000 grains, or 360 lbs., of oxalic acid; and, as oxalic acid is worth 10d. per lb., 1000 cubic feet of hydrogen will have cost, not 3d., but 3600d., or £15 sterling. Need we add another word of comment?

A GAS CALORIMETER.

By C. V. Boys, F.R.S.

[A Communication presented to the Royal Society, Dec. 7, 1905, and reprinted by permission.]

In the report of the Gas Section of the Electrical and Gas Exhibition held at the Crystal Palace in 1884, there is an illustrated account of a gas calorimeter devised by Mr. F. W. Hartley for the purpose of testing the calorific value of the gas used in the cooking and heating apparatus shown in the exhibition.

In this instrument the gas to be examined is passed through a delicate meter and governor, after which it is burned in a bunsen burner in the instrument. The heat is taken from the products of combustion and the unchanged air by means of a stream of water, the rate of flow and rise of temperature of which are determined. From these observations, the calorific value of the gas can be deduced. Mr. Hartley considered the very small corrections due to the effluent gas being slightly different in temperature from the surrounding air; also corrections due to adventitious loss or gain of heat, and to the change in the specific heat of water with temperature. The paper unfortunately only occupies five pages, and the construction of the details of the instrument can only be inferred from the figure.

The Hartley type of apparatus has in the last 14 years become well known owing to the sale of the excellent instrument designed by Junkers. I have had occasion to use this instrument a good deal; and while I in no way criticize it on the ground of want of accuracy, I have found it unwieldy and inconvenient in use. If the water and gas supply and the water escape, as provided, suit the surroundings, well and good; if not, pipes must be taken round to adapt the surroundings to the instrument. The thermometers for the inlet and outlet water are at very different levels, and the instrument is inordinately high, so that if placed on a table or by the side of an ordinary sink, the observer has to keep climbing up and down in order to read the two thermometers and make notes. The thermometers and the reading-glasses provided are admirable. In this respect, improvement appears impossible; but the readings easily made to 1·100° C. are vitiated by the constant spasmodic jumps of the indication of the outlet thermometer in consequence of warmer and cooler streaks in the issuing water. These irregularities may amount to 1·10° more or less; and though they are not enough to introduce error of consequence, they give the opportunity to different observers to read on the whole high or low, and they may encourage the idea that accuracy in reading the thermometer is not of much consequence. The water content of the instrument is 1700 c.c.; and so, with a usual rate of flow, from two to three minutes are required to change the water. This large content, and the consequent time of change, must be taken into account if the temperature of the inlet water is undergoing a small but steady variation at a rate sufficient to be observed in this time. Simultaneous measures of inlet and outlet temperature would not give the true rise of temperature; to approximate to this the inlet readings should be taken two or three minutes before the corresponding outlet readings—the interval depending on the rate of flow. A more serious objection to a large water capacity is the time that the observer must wait before the final temperature is reached—the last creeping up being very slow.

I have also experimented with two other makes of gas calorimeter; but I have found that they are little more than copies of the Junkers instrument. The spasmodic variations of the outlet readings are quite as great; the water content in one of them is nearly 6 litres; and nothing has been done in either to reduce the inconvenient height, or to increase the facility with which they may be adapted to their surroundings.

Professor Threlfall has designed a calorimeter with a view especially to keeping a continuous record of the variation of the calorific power of gas. I have not seen this instrument or any complete account of it, but Professor Threlfall has informed me that he has kept the water content as low as he could.

I have had to examine existing calorimeters in consequence of a change in the law with regard to the testing of gas in London. From Jan. 1 next the calorific value is to be taken; and it is the duty of the Gas Referees to prescribe the mode of testing. From a purely official point of view, the three calorimeters examined have the disadvantage that they are soldered up; so that it is impossible to tell what is inside them, or to see if they are made according to instructions.

The calorimeter shown in section in fig. 1 will, I believe, be found to be free from the disadvantages enumerated; and it has the peculiarity that it can be taken entirely to pieces in a few minutes, so that all parts may be examined.

A circular base A carries the gas-pipe and tap terminating in a pair of No. 3 union-jet burners B. The top surface is protected from radiation by a disc of bright metal, which is held down by the screws which fix the three centring blocks C. In the base, a governor may be inserted (or an ordinary balance governor may be used instead) to counteract the variation in pressure resulting from the working of the meter.

On the three centring blocks C rests a vessel D, of sheet brass, with a central chimney of thick sheet copper E. On one side, 1 inch from the bottom, a side tube F is fastened so that condensation water may drip from this into a measure placed to receive it. Of course, the vessel D may be turned round, so that the drip-tube lies in any direction with respect to the gas-inlet.

Attached to the lid G are the essential parts of the calorimeter. Beginning at the centre, where the outflow is situated, there is a brass box which acts as a temperature equalizing chamber for the outlet water. Two dished plates of thin brass K are held in place

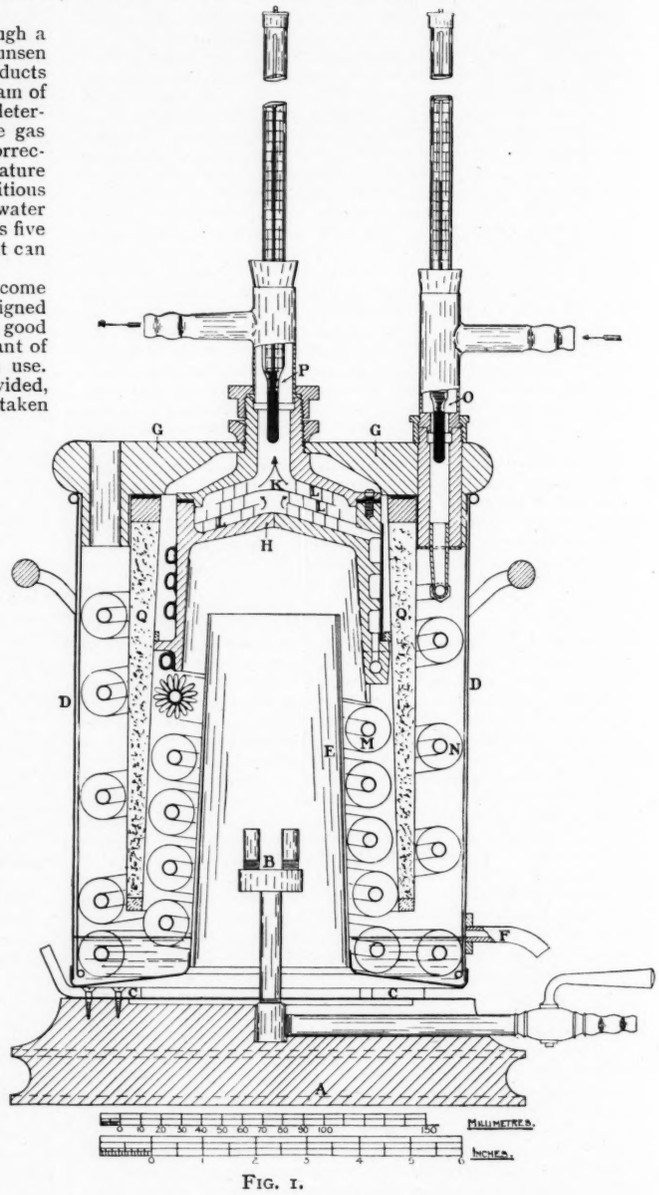


FIG. 1.

by three scrolls of thin brass L. These are simply strips bent round, like unwound clock springs; and no attempt should be made to prevent all leakage from one spire to the next, as a little will be advantageous in encouraging temperature equalization. For the same reason, a little leakage from each spire to the one above may be allowed. The lower or pendant portion of this box is kept cool by circulating water, the channel for which may be made in the solid metal, as shown on the right side, or by sweating on a tube, as shown on the left. Connected to the water channel at the lowest point by a union are six turns of copper pipe, such as is used in a motor-car radiator. I have employed a helix of copper wire wound round the tube and all sweated together—the well-known invention of Mr. T. Clarkson, of Chelmsford, who kindly sent me the wire for the purpose. A piece of such tube is shown in fig. 2. I have no doubt, however, that squares of sheet copper, as shown in fig. 3, threaded on to the pipe and all sweated together, or a series of radially disposed copper strips cut so as to allow the pipe to be wound upon them and then be bent over outside, so as to make good sweating contact with it, would answer as well. A second helix of similar pipe surrounding the first is fastened to it at the lower end by a union. This terminates at

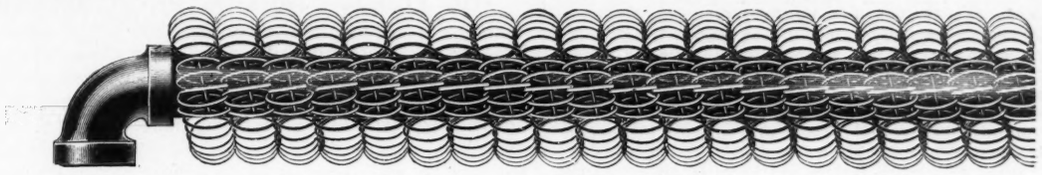


FIG. 2.

the other end in a block, to which the inlet water box and thermometer holder are secured by a union, as shown at O. A similar outlet water box P and thermometer holder are similarly secured above the equalizing chamber H. The lowest turns of the two coils M and N are immersed in the water, which in the first instance is put into the vessel B.

A further alternative for the inner but not the outer coil, which would, no doubt, answer well, could be made by winding a sheet of copper wire gauze (six wires to the inch) into a cylindrical form, winding the pipe upon the gauze, and a second sheet of gauze upon the pipe, and then sweating all together.

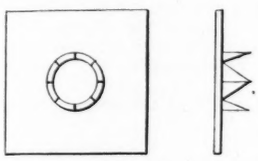


FIG. 3.

Between the outer and the inner coils M N is placed a brattice Q, made of thin sheet brass, but containing cork dust to act as a heat insulator. The upper annular space in the brattice is closed by a wooden ring, and that end is immersed in melted rosin and beeswax cement, to protect it from any moisture which might condense upon it. The brattice is carried by an internal flange which rests upon the lower edge of the casting H. A cylindrical wall of thin sheet brass, a very little smaller than the vessel D, is secured to the lid; so that when the instrument is lifted out of the vessel, and placed upon the table, the coils are protected from injury. The narrow air-space between this and the vessel D also serves to prevent interchange of heat between the calorimeter and the air of the room.

It will be noticed that the two thermometers for reading the water temperatures, and a third which may be added for reading the temperature of the outlet air, are all near together and at the same level; that the lid may be turned round into any position relatively to the gas-inlet and condensed water drip that may be convenient for observation; and that the inlet and outlet water-boxes may themselves be turned so that their branch tubes point in any direction. The instrument is convenient also in its small height; the thermometers being comfortably read when the instrument is standing on an ordinary table.

For regular testing purposes there is no need to use different rates of flow of water at different times. I therefore fasten an overflow water funnel (fig. 4) on the wall at a convenient height over the sink, and connect it by india-rubber tubes with a supply tap from the main and with the inlet O of the instrument. A uniform rate of flow is most easily attained by the use of a diaphragm in the supply pipe, which has been reamed out to allow the desired flow to pass through the instrument with the given head. There will be no occasion afterwards to adjust this.

The flow of air to the burner is determined by the degree to which the passage is constricted at the inlet and outlet. I have found that if the three centring blocks are made of material $\frac{3}{16}$ inch thick, and the gas escapes by five holes $\frac{5}{8}$ inch in diameter made in the outer portion of the lid, the flames burn well, do not smoke, and an unnecessary excess of air is prevented from passing through the instrument. A sixth hole may be provided for a thermometer, so placed as to measure the temperature of the outlet gases.

Mr. Butterfield has examined the escaping gases, and finds that when the gas is burning at the rate of 5 cubic feet per hour they contain 7 per cent. of oxygen and 8 per cent. of carbonic acid, from which he infers that the proportion of air to gas is about $8\frac{1}{4}$ to 1. It follows from this that the correction for rise or fall of temperature of the air passing through the instrument is as near as possible one-third of a calorie to the cubic foot of gas for each degree Centigrade of change. An examination of the effluent gas when only four holes were left open showed that the oxygen was reduced to 5·6 per cent.; but even so no trace of combustible gas could be detected.

A feature peculiar to this calorimeter is the absence of water cooling from all but the lower end of the chimney. Being made of copper $\frac{1}{16}$ inch thick, and with its base in contact with water, it is prevented from becoming hot enough to burn; while at the same time it is so hot that condensation does not occur upon its inner surface, and so the collection of the condensation water is simplified. Another advantage of the hot chimney is its extra aëro-motive power; so that the instrument can safely be made of far less than the usual height. The heat passing by condensation down the chimney into the water pool at the bottom is carried away by the water in the two immersed turns of pipe. Heat radiated downwards is in part reflected back by the bright metal shield over the base, but in so far as the reflection is imperfect, and the thin metal is warmed, it gives up most of its heat to the incoming air, which sweeps over it and so carries it back into the instrument.

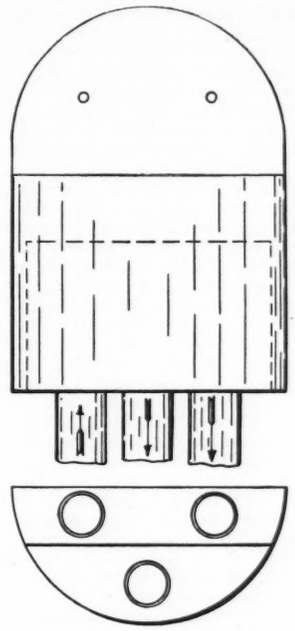


FIG. 4.

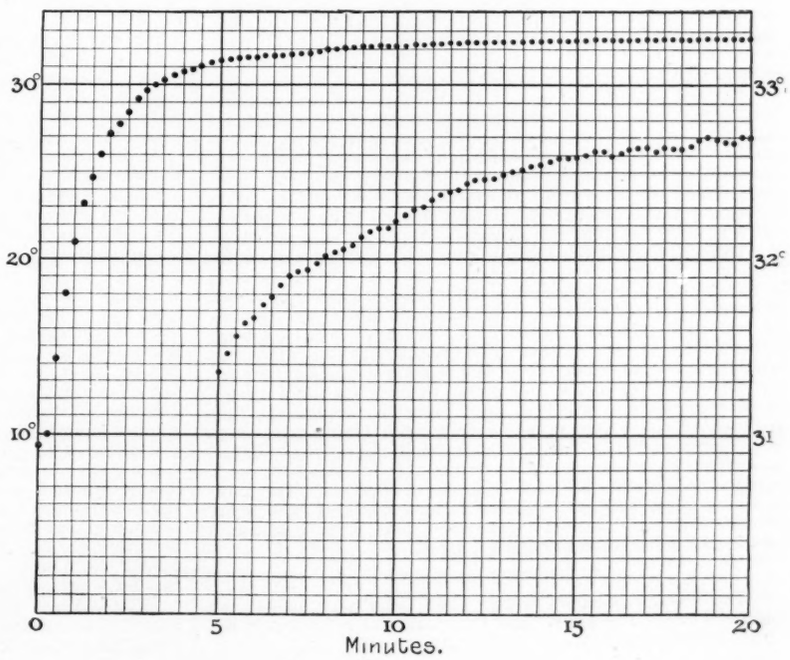


FIG. 5.

It may be well to state that the object of measuring the condensation water is to find how much of the total heat is due to condensation of steam and cooling of the water down to the temperature of the drip. If this is subtracted, the result will give the heating value of the gas for operations in which the steam is not condensed; and this is generally known as the net, as distinct from the gross, calorific value.

In order to prevent corrosion of the metal surfaces by the continued soaking action of very dilute sulphuric acid and dissolved oxygen, the whole of the coil system can be lifted up out of the vessel D when the measurements have been made, and placed in a jar containing a very dilute solution of carbonate of soda. This source of destruction is likely to become more damaging in the near future than it has been in the past, in consequence of the great increase in the amount of sulphur which, without lime purification, will be left in the gas. Any deposit of lime that may be formed in the pipe system and equalizing-box can be removed by passing very dilute hydrochloric acid through, and washing out with water. By these means it is hoped that the calorimeter will be available for daily use and be practically indestructible.

When I first considered how best the irregular outlet temperature of existing calorimeters could be made more uniform, I concluded that an inversion of the usual arrangement was essential, that, in fact, the gases should have plenty of space to pass gently through the instruments, and that the water should be taken through every channel strictly in series—all alternative parallel flow being prejudicial. The small pipe suitable for such construction, provided it is fortified with heat-collecting ribs or wires, can still carry abundant water, and absorb the whole of the heat, and it has very small water capacity. At any rate such a construction, with the additional equalizing-box, shows at times irregular variations of only 0·01° or 0·02° C., even with the total rise of 24° C. and without any device for in part shielding the thermometer bulb from direct contact with the stream of water. The water content of the coil and equalizing-box is 300 c.c.; and of the space in the vessel D up to the overflow, 400 c.c.

It will be seen from fig. 5—in which are plotted observations of the outlet temperature made every quarter minute from the time of lighting the gas—that, five minutes after lighting up, 21° out of the 22° rise have been attained; that in 10 minutes a further rise of $\frac{1}{2}$° has occurred; and that in a quarter of an hour there is only $\frac{1}{10}$° remaining. A reading taken 55 minutes after starting showed the outlet water to be at 32·85°.

The rise of 0·15° in the last 35 minutes is no more than that which corresponds to the usual rise of calorific value of the gas in Victoria Street, taken at intervals during the day. The small waves in the portion of the curve drawn to ten times the scale are the result of friction in the meter, in consequence of which the governor was in constant motion.

I must express my indebtedness to Messrs. Griffin and Sons, of Sardinia Street, who made a trial instrument for me when I was away in South Africa, and therefore out of reach. They have carried out my instructions accurately, and to my entire satisfaction.

Distributing Gas at High Pressure by Means of Fans.

Since the reading of Mr. R. Herring's paper at the meeting of the Southern District Association, on the use of a high-speed exhauster for raising the pressure in gas-mains, the attention of our readers has been much directed to the subject of the distribution of gas at high pressure, and the employment of fans or turbines for the purpose. In this connection, a fact may be pointed out which is frequently lost sight of when a purchaser is selecting a fan—namely, that a true test of the efficiency of the machine is not merely its volumetric capacity against no resistance, but its volumetric capacity per horse power when working against a specified resistance. A small fan run at high speed, though possibly cheaper in first cost, may easily require 50 per cent. more power than a larger one, run at slower speed, would take to do the same work. For example, a small fan run at high speed requires 15 brake-horse-power, against 10 brake-horse-power taken by a larger one worked at a slower rate. If a fair average of £15 is taken as the annual cost per brake-horse-power, it will be seen that at the end of thirty years, which is the normal life of a well designed and constructed fan, a sum of upwards of £5300 (reckoning compound interest at 5 per cent.) will have been spent unnecessarily. Hence the importance of employing larger fans run at slower speed, as, though their first cost may be higher, they are very much cheaper in the end, owing to their low running cost. These remarks are prompted after glancing through the new sectional catalogue (No. 43) of the Sturtevant Engineering Company, Limited, illustrating and describing their "steel plate" fans, which have been expressly designed for dealing with large volumes of air with the least expenditure of power. The catalogue has been well got up; the various kinds of fans being effectively shown, while the descriptive and other particulars furnish full information in regard to them.

The late Mr. Charles Marsh Vialls, who was one of the Directors of the Southwark and Vauxhall Water Company, left estate valued at £31,271.

THE PUBLIC LIGHTING OF EDINBURGH.

Readers are aware, from references to the matter which have from time to time appeared in our "Notes from Scotland," that, in consequence of complaints made in the Edinburgh Town Council in regard to the illuminating power of the gas supplied from the Granton works, it was decided to appoint an expert to report on the whole question of the lighting of the city; and Mr. J. F. Simmance, Assoc.M.Inst.C.E., was selected for the purpose. He was engaged upon the work in the summer, and his report came before a Committee of the Gas Commissioners last week. In view of the importance of the subject, we give the document, long though it is, practically in its entirety.

Dear Sir,—I have concluded the series of investigations your letter of June 6, 1905, instructed me to carry out, and now have the honour of placing the following report before you.

That letter, read in conjunction with mine of April 15, 1905, indicates the scope and direction my examinations should assume, and I briefly outline this reference as follows:—

1.—What is the illuminating power of the gas supplied to the city of Edinburgh, and what loss, if any, of such illuminating power is incurred in the distribution from the Granton works?

2.—At what pressure is such gas delivered to different parts of the city, and what is the voltage of the electric current?

3.—What are the illuminating powers of the street-lights—(*a*) the electric arc lamps, and (*b*) the gas-lamps of the types usually adopted. (*c*) What is the general lighting effect between lamps of each kind at their usual distance apart?

4.—Consumptions and powers of stair lighting.

To carry out these investigations, it was decided to instal three temporary testing-stations—(*a*) at the Synod Hall, Castle Terrace; (*b*) at the Old Tramway House, High Street, Portobello; and (*c*) at South Morningside Schools.

The first of these may be taken as four miles by the gas route from the Granton works; the gas supplied to the second travelled about 8½ miles; and the Morningside Schools are on the trunk main of about 5½ miles in length from Granton. Thus a wide area was covered; and the loss in illuminating power suffered in outlying districts may be gauged from the results obtained at these stations.

Bearing in mind the discredit thrown on portable photometry by the decision of the Parliamentary Committee sitting under the presidency of Mr. Mark Oldroyd in 1900, on the matter of the London County Council Bill (which asked for powers to legalize such photometry), no pains were spared to instal each testing-station in such a manner as to render it free from the possibility of challenge. Arrangements were made to ensure adequate ventilation; and the temperatures were at no time abnormal. The rooms were carefully draped in black cloth, to cut off reflection; all natural light being excluded.

The apparatus used [see appendix] was of the most complete and efficient description; and, as I deemed it desirable that the same instruments should be used at each station, I transported in large vans the whole of the apparatus for successive use in each of the stations, which were, as pointed out above, fitted up with great care. The water used in the measuring instruments was drawn from a gasholder tank at New Street, and the same was used, without emptying any vessel, throughout the tests. The tests were made almost continuously during several days in each case; the first being effected in 24 hours after the erection of the apparatus and the lighting of the gas, which then burned night and day.

At the Synod Hall, a special service was run from the street to the station; at the Portobello station, gas was used from a 2-light consumer's meter. This I am aware would, *a priori*, appear to be treating the gas unfairly. But it was found that the gas, tested for specific gravity, was the same as that being consumed in other houses; and as the object of the investigation was primarily in the consumers' interests, the course mentioned was adopted.

At the South Morningside Schools, the gas also was taken through the meter. The schools being closed, the gas used in the testing-room formed the only draft upon the large service; but, for the reason stated above—viz., that a single consumer in a large building supplied through one general meter would be in exactly the same position—I decided to test in this manner. Further, I decided to use for testing purposes an argand burner consuming from 3 to 3⅛ cubic feet of gas per hour; this being a more usual rate of burning gas in Edinburgh than the large union-jet burner prescribed for testing by the Edinburgh Gas Act, which burner, it must be borne in mind, is coupled with the ordination that the gas must be of 20-candle power. Tests were however, made, in each case with both the 20-candle standard burner (No. 7 standard batswing) and the 3-feet argand, which I now term the 25-candle burner.

[The averages of all the tests on both burners are given in the report; each reading being the average of many, and these again being the average for the day. The following are the averages

(in candles) for each station: Synod Hall (July 2 to 9)—20·74, 23·54, 24·84, 28·19, 21·89; total average, 23·84. Portobello (July 11 to 17)—22·52, 22·56, 22·33, 22·02, 21·67, 21·68, 20·05; total average, 22·02. Morningside (July 20 to 22)—22·02, 23·65, 24·19; total average, 23·28. Tests were made on one occasion at the Granton Gas-Works; but they are not included in the above series, as Mr. Simmance had no means of verifying the source of the gas tested. From these results he formed certain conclusions which are summarized later.]

I beg to call attention to the great variations observed in the quality of the gas at the Synod Hall; the range being from 13 per cent. below to 18 per cent. above the average. At Morningside, the results range from 5·4 per cent. below to 4·1 per cent. above the average; and at Portobello the range is from 4·4 per cent. below to 2·4 per cent. above. As there is no provision at Granton for the manufacture of separate gases for these three districts, it may be taken for granted that the same gas is supplied to each; and therefore it is necessary to consider the reasons for the changes in quality. In the latter case of Portobello, the gas is supplied by a trunk main (not exclusively for Portobello) into a store holder in Pipe Street, and thence to the district. It is extremely probable that in the summer this holder is never entirely emptied, and thus fresh gas is constantly mixed with that made on previous days. Nevertheless, the mixture should be fairly complete; and it is thus obvious that the consistent results of the testing from day to day were owing to the fact that the quality was constant, or so nearly so as to be deemed constant. This gas is pumped by the trunk main from Granton *via* Duddingston, and thus travels about eight miles.

With a gas of 16-candle power, as supplied in London, such a travel would necessitate that at least a quality of 16¼ or 16¾ candles should be manufactured at the works in order to deliver at 16 candles at a testing-station. If the mains were comparatively small, a larger loss than this must be anticipated. The comparative constituents of Edinburgh and London gas thus afford a fair means of computing the original power of the gas tested at Portobello—the rule being universally accepted that the loss by travel is relatively greater as the amount of hydrocarbon in the gas increases; and it is upon this basis that my conclusions have been arrived at.

At Morningside, we have a gas supplied direct from Granton to the testing-station by a trunk main. The distance is less than to Portobello, and no storeage holder intervenes. I therefore anticipated results which would show less loss than in the Portobello case. The tests proved the accuracy of such expectation; the gas being higher in power, and, I think, attaining its proper condition on the second and third day after the tests commenced. I believe the first day's tests of 22·02 candles to be low through the circumstances of the test. Had the gas been in use largely in the schools for the preceding week, I consider that the first day's tests would have been higher in results. They are included, however, with the others, in order to place all the stations on an equal footing.

The excessive variations at the Synod Hall must be considered in the light of the peculiar conditions. Here we have a gas drawn from a comparatively dead main which is linked up with a series of mains supplying parts of the city (so far as I could ascertain) untouched by the newer system shown on the maps supplied me. The varying levels of the city would appear to render the provision of a less complicated system of mains very difficult and costly; but I must express my opinion that, from the consumers' point of view, the great variations in the quality of gas with which, doubtless, many of them are supplied, render the provision of suitable burners for such gas a matter of great difficulty. At the same time, though such variations are beyond the control of those responsible for the gas manufacture, yet it is clear that some means should be provided for equalizing the illuminating power of such gas.

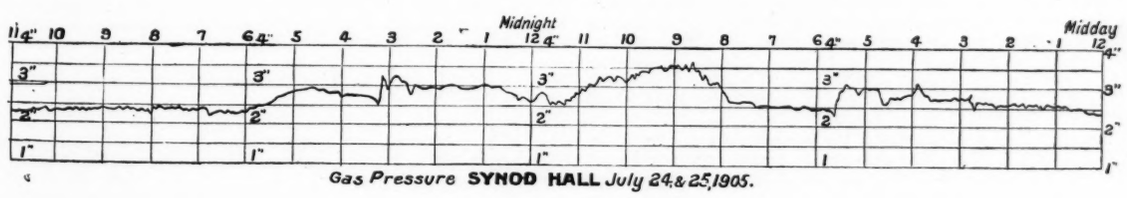
Now, the essential point in a gas supplied for lighting, heating, or power purposes, is constancy; as with a given and regular quality the best results for such can be obtained by the use of burners, gas-fires, and engines adjusted in their air supplies to the best point of efficiency; and I have no hesitation in stating that a perfectly regular supply of (say) 18-candle gas would give more satisfaction in this portion of Edinburgh than the varying qualities obtained at Synod Hall—always presuming that the hall, by its situation, may be taken as fairly representing the centre of the city.

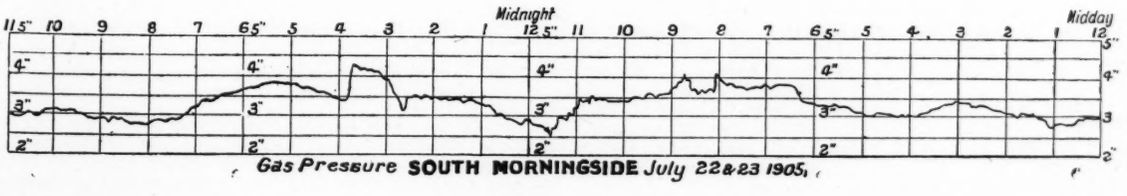
It must be pointed out that the variation of quality mentioned could not occur in manufacture. The methods of gas making and storing render this impossible; and thus, taking it for granted that the gas supplied to Portobello, Morningside, and Castle Terrace are the same initially, it would appear that, in addition to the inevitable loss due to the high quality of the gas made, it is to the conditions of the gas consumption in the centre of the city that we must look for an explanation of the variations in the Synod Hall tests, where alone any abnormal variation was observed. We have here a large system of mains linked up throughout, and supplied at the east and west by trunk mains. There is no reason to believe that the draft on the subsidiary mains is of such an amount as to present constantly to the consumer fresh gas from the trunk mains.

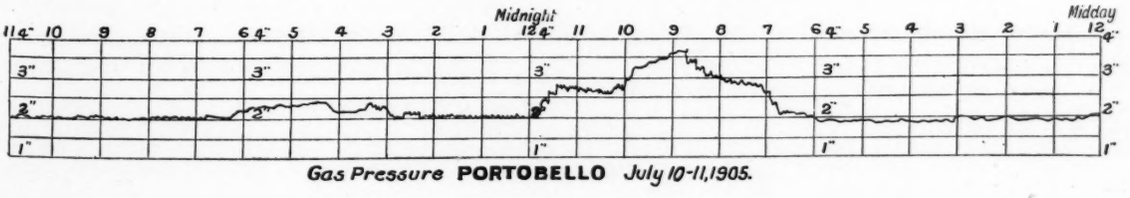
A large proportion of the streets are lighted with arc lamps, and, taking as an example High Street, the gas consumption must practically cease after the house lights are extinguished. With a gas such as that supplied in Edinburgh, the consequence of its lying inert for a few hours is disastrous, as it is absolutely at the mercy of the atmospheric changes, and may deposit hydrocarbons, or pick them up, according to circumstances. The Synod Hall tests show conclusively that this occurred; and in winter the violent changes must be more marked, and much more detrimental to the consumers' interests. I would suggest that with the increase of electric street lighting this variability of quality of gas will be more noticeable, and, conversely, would be distinctly abated were a constant draft of gas kept on these mains during the night by means of gas street lighting.

In the earlier days of the gas undertaking in Edinburgh, the gas was not only of an entirely different nature, being plain cannel (now impracticable, from natural causes), but was used for all street lights. Thus throughout the night a constant steady current was circulating through each main, every street participating in the draft. The results to the consumer must have been beneficial, and the loss of power in the mains considerably less. The quality may well have then been comparatively unvarying, with the natural consequence that satisfactory lighting was obtained.

Pressure.—In all statutory requirements as to pressure in the United Kingdom, the only stipulation is the minimum pressure; no mention being made in any case of a maximum. The reasons are, first, that leakage from mains is increased by a high pressure; and thus the tendency of a gas undertaking, from mere motives of self-interest, is to keep the pressure as low as possible consistent with the supplying of distant districts; and, secondly, that as long us a minimum pressure is maintained, it is possible, and proper, to automatically govern the consumption of gas at each burner, or at each house, to a regular amount. In this respect the gas consumer is better placed than the electricity consumer, as there is no practical method of automatically governing voltage.







Diagrams of pressure were secured at the Synod Hall, Morningside, and Portobello; and in no case did the pressure drop below 2·2 inches at the hall, 2·5 inches at the South Morningside schools, and 2 inches at Portobello—approximately. Many diagrams were taken, and all secured in the same district are remarkably alike, evidencing careful governing and regulation of the pressure. The slight fluctuations are evidently owing to the variations in the demand.

Other tests made during the heavy lighting hours on Sunday, July 9, were as follows:—

	Inches.		Inches.
Leith Street Terrace	2·7	North Back of Canongate	2·3
Greenside Road	2·5	Canongate	2·5
Broughton Street	2·4	St. John Street	2·5
St. John's Hill	2·4	Craig's Close	3·0
St. Mary's Street	2·4	Grassmarket	3·4
Bath Street, Portobello	2·8	Pipe Street, Portobello	2·7
South Foulis Close	2·9	High Street, Portobello	2·8

These tests were taken when removing burners for testing from the common stairs.

Electrical Supply.

Tests of voltage were made on two successive Sundays, and constantly during the lighting hours from 9 p.m. to 1 a.m. on July 25 at Portobello, during the night of July 18 at the Public Baths, and at Joppa (Queen's Hotel) on July 17. As the mere statement of voltage is of little use to the consumer except in relation to its effect upon his lighting, at the Synod Hall on July 25 and at the Portobello Baths on July 18 careful photometric tests were made upon an aged lamp running upon the ascertained voltages; and thus I am enabled to submit diagrams which record both pressure (or voltage) and illuminating power. The figures require very little comment. At the Synod Hall, representing the centre of the city, no possible fault can be found with the electric supply, which is excellent. As a matter of interest, it may be mentioned that the switching on of every light in the hall (some hundreds) caused a drop of 2 volts at the main terminals. At the test at the Queen's Hotel, Joppa, lights (about 40) were lighted up gradually until all were at work. At the Baths, Portobello, the 16-candle lamp on the photometer was the only one on the current excepting as stated on the diagram. It will be seen that any complaints from Portobello as to low voltage have been unfounded. What has occurred is a fluctuation in voltage; and fluctuations in light have been caused by the changes from a high voltage to something approaching normal; and the deteriorating effect of this voltage upon 230-volt glow lamps must be very considerable. The variation in candle power of the lamp during the test was very great—nearly 100 per cent.; and this must have occurred on every lamp in use in the district working on the same voltage.

Street Lighting.

The tests were made by means of the photometer described in the appendix. The following explanations and comparisons are necessary to make clear the course pursued and the results obtained: A foot-candle is the light thrown by the flame of a standard spermaceti candle (of six to the pound) upon a surface placed normally at 1 foot from the flame. Such a candle enables print such as a "Times" leading article to be read by young eyes at a distance of 20 feet in a room otherwise dark. A man of forty, with normal sight, requires greater illumination, and can read at a distance of only 12 feet from the flame. The writer can read at only 9 feet from the flame. The moon, three days past the first quarter, 12 degrees above the horizon, at 11.30 p.m. on July 12, gave a light equal to a standard candle held at a distance of 12·6 feet. The daylight from the zenith, in Cambridge Street Lane, at 9 p.m. on July 4, equalled a standard candle at 1 foot 1 inch, the sky being absolutely clear of cloud.

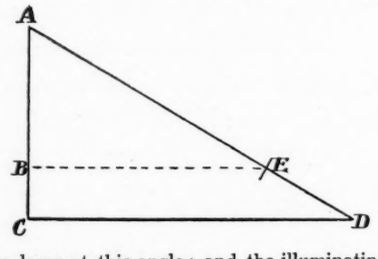
The expression "foot-candles" is, to some extent, a misleading one, because it would appear at first glance that if 1 foot-candle is the light 1 foot from a candle, then ½ foot-candle is the light 2 feet from a candle. This, however, is not so, as will be seen from the appended explanation of the formulæ used. In order, therefore, to make the results quite clear, I have converted each expression of foot-candles into a statement of the distance in feet at which a candle must be held to give a light equal to that of the lamp under consideration.

It should be noted, in looking at the results, that the power is in inverse ratio to the distance at which a candle is held. Thus the light equal to a candle held at 2 feet is very much greater than that equal to a candle held at 57·7 feet.

It will also be obvious that as no lamp emits the same amount of light in all directions, the light varies according to the angle at which it is observed; and the theoretically perfect lamp would be that whose light at any point on the ground is equal to a candle held at the same distance in every case.

A is a source of light.
A C is the length of the lamp-column.
C D is the ground line.
B C is the height of the photometer.
E is the point at which the reading of the illuminating power was taken.
B A E is an angle of 60 degrees.
B E A is therefore an angle of 30 degrees.

In order to find the illuminating power of the source of light—*i.e.*, the lamp under test—it is necessary to find the length of A E in feet, to observe on the photometer the distance in feet (x) at which a candle must be held at E in order to equal the light



given by the lamp at this angle; and the illuminating power is then found from the following formula:—

$$\left(\frac{x}{AE}\right)^2 = I = \text{the illuminating power.}$$

In order to find the illuminating effect in foot-candles thrown by the light A at the angle B E A upon the ground, it is necessary to extend A E to D; and the illuminating effect is then found from the following formulæ:—

(*a*) $\frac{I}{AD^2} = F$ = the illuminating effect at D, but on a line at right angles to the line A D.

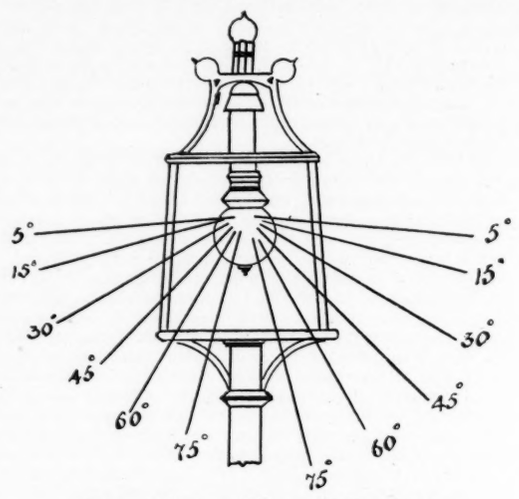
(*b*) $F \times \cos 90 - BEA = G$ = foot-candles at D on the ground surface or pavement.

Now, G represents foot-candles—a term of expression used in light-tests which conveys little to the lay mind. In order to make this clearly understood, I have converted each expression of foot-candles into a statement as to the distance in feet at which one candle must be held to give an equivalent light. This conversion from G is arrived at as follows:—

$$\text{Distance at which a candle must be held} = \sqrt{\frac{I}{G}}$$

Results of Street-Lighting Tests.—The same angles of illumination have been tested in each case; the only deviations from this rule being occasioned by the necessities of the varying levels of the ground-line. For comparative purposes, they may be taken as relatively the same angle.

Electric Lamps.



Fifteen-Ampere Electric Arc Lamp.

15-Ampere Arc Lamp in Princes Street, opposite No. 120.

θ±	Candle Power.	Light on Ground in Foot Candles.	Equal to Candle held at	Distance from Column.
71	147·37	·24435	2·02 feet	7·9 feet
57	410·87	·465	1·46 ,,	14·9 ,,
42·30	617·52	·363	1·65 ,,	25 ,,
28	841	·116	2·93 ,,	43 ,,
15	744·19	·02	6·4 ,,	85 ,,
6	656·89	·0013	27·7 ,,	218 ,,

15-Ampere Arc Lamp in Princes Street, next Lamp.

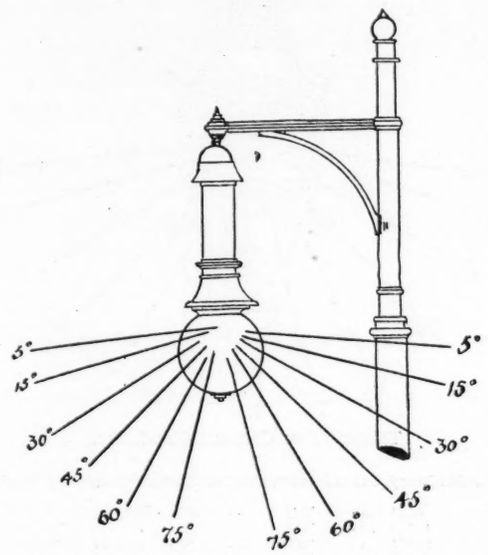
71	148·4	·246	2·01 feet	7·9 feet
57	408·84	·463	1·469 ,,	14·9 ,,
42·30	638·57	·375	1·63 ,,	25 ,,
28	811·11	·153	2·54 ,,	43 ,,
15	732·78	·032	6·5 ,,	85 ,,
6	618·51	·0012	27·9 ,,	218 ,,

Four 15-Ampere Lamps selected at random in Princes Street, and tested at one angle only for comparative purposes.

35·5	844·48	·1600	2·5 feet	32·2 feet
35	786·80	·1525	2·56 ,,	32·8 ,,
35	778 96	·1506	2·57 ,,	32·8 ,,
35·9	816·24	·1508	2·574 ,,	31·8 ,,

15-Ampere Lamp, Sea Front, Portobello, Corner of Melville Street.

θ±	Candle Power.	Light on Ground in Foot Candles.	Equal to Candle held at	Distance from Column.
75	84·78	·09	3·31 feet	6·1 feet
60	112·99	·17	2·42 ,,	13·2 ,,
45	119·02	·06	4·0 ,,	23 ,,
30	222·60	·04	5·0 ,,	39·79 ,,
15	213·16	·005	14·1 ,,	85·1 ,,
5	291·72	·0003	57·8 ,,	262·2 ,,



TEN-AMPERE ELECTRIC ARC LAMP.

10-Ampere Arc Lamp, junction of Grindlay Street and Lothian Road.

61	132·94	·168	2·43 feet	12·7 feet
45	357·58	·231	2·07 ,,	23 0 ,,
25	572·16	·79	1·12 ,,	49·2 ,,
13	291·72	·0066	12·28 ,,	98·9 ,,
5	453·69	·0005	44·7 ,,	262·2 ,,

10-Ampere Arc Lamp, Corner of Cambridge Street and Castle Terrace.

64	187·4	·24	2·0 feet	11·2 feet
45	243·04	·154	2·54 ,,	23 ,,
24	176·89	·026	6·16 ,,	51·5 ,,
14	157	·0039	15·9 ,,	92·2 ,,
5	271·26	·0003	57·7 ,,	262·2 ,,

10-Ampere Arc Lamp, Chambers Street, by Watts College.

71	114·91	·178	2·36 feet	7·9 feet
57	220·81	·244	2·02 ,,	14·9 ,,
45	338·92	·229	2·08 ,,	23 ,,
32·30	325·8	·085	3·39 ,,	35·8 ,,
20	137·12	·009	10·5 ,,	63 ,,
6	368·64	·0007	37·7 ,,	218·5 ,,

10-Ampere Lamp before Holyrood Palace.

72	111·3	·194	2·26 feet	7·36 feet
58	142·56	·161	2·48 ,,	15 ,,
45	166·15	·111	3·0 ,,	23 ,,
28	212·86	·041	4·89 ,,	43·24 ,,
15	256·32	·008	11·1 ,,	85 ,,
7·30	255·68	·0009	33·3 ,,	172·5 ,,

10-Ampere Arc Lamp corner of Windsor Place and High Street, Portobello.

75	52·78	·08	3·4 feet	6·16 feet
61	58·2	·07	3·7 ,,	12·7 ,,
42·30	96·04	·057	4·22 ,,	25 ,,
28	101·00	·019	7·24 ,,	43·24 ,,
14	158·76	·004	15·8 ,,	92·23 ,,
6	213·45	·0003	57·7 ,,	218·5 ,,

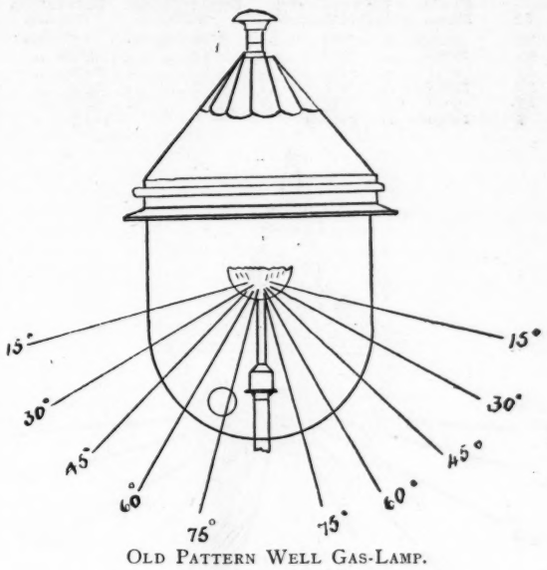
10-Ampere Arc Lamp, corner of Melville Street and High Street, Portobello.

42·30	83·59	·051	4·41 feet	25 feet

10-Ampere Arc Lamp, corner of High Street and Pitt Street, Portobello.

75	83·64	·126	2·82 feet	6·16 feet
60	106·29	·121	2·87 ,,	13·2 ,,
42·30	219·33	·126	2·82 ,,	25 ,,
27	254·08	·045	4·69 ,,	45 ,,
15	146·89	·004	15·8 ,,	172·5 ,,
4·30	340·03	·0003	57·7 ,,	292·1 ,,

GAS-LAMPS.



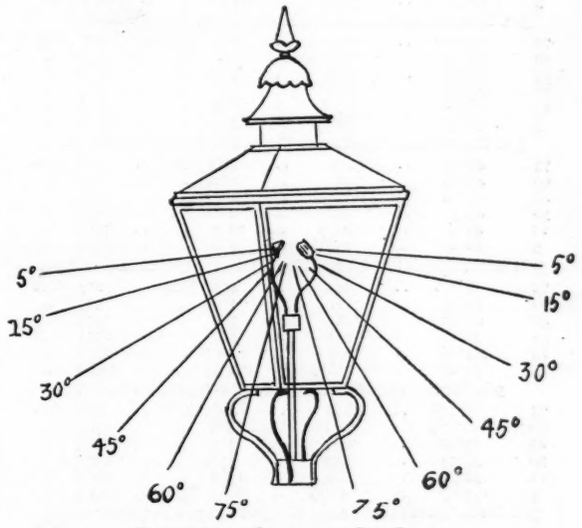
OLD PATTERN WELL GAS-LAMP.

Well-Lamp, One 2-ft. Flat-Flame Governor Burner, Rutland Square, opposite the Royal Engineers' Office.

θ±	Candle Power.	Light on Ground in Foot Candles.	Equal to Candle held at	Distance from Column.
32	3·90	·005	14·1 feet	16·8 feet
16	3·10	·0005	44·7 ,,	35·7 ,,
11	5·57	·0003	57·7 ,,	53·5 ,,

Well-Lamp, One 2 ft. Flat-Flame Governor Burner, King's Park.

75	3·17	·023	6·5 feet	2·7 feet
60	3·49	·019	7·2 ,,	5·98 ,,
45	2·48	·009	10·09 ,,	10·5 ,,
30	3·55	·004	15·8 ,,	25·5 ,,
15	4·67	·0007	37·7 ,,	38·8 ,,
5	5·54	·00004	—	119·7



FOUR-FEET CRESCENT GAS-LAMP.

4-ft. Crescent Lamp. Two 2-ft. Flat-Flame Governor Burners, Gillespie Crescent.

75	4·38	·036	5·24 feet	2·7 feet
60	10·12	·056	4 18 ,,	5·98 ,,
45	9·15	·035	5·33 ,,	10·5 ,,
30	11·71	·012	9·1 ,,	25·5 ,,
15	7·06	·001	31 6 ,,	38·8 ,,
5	11·51	·00009	— ,,	119·7 ,,

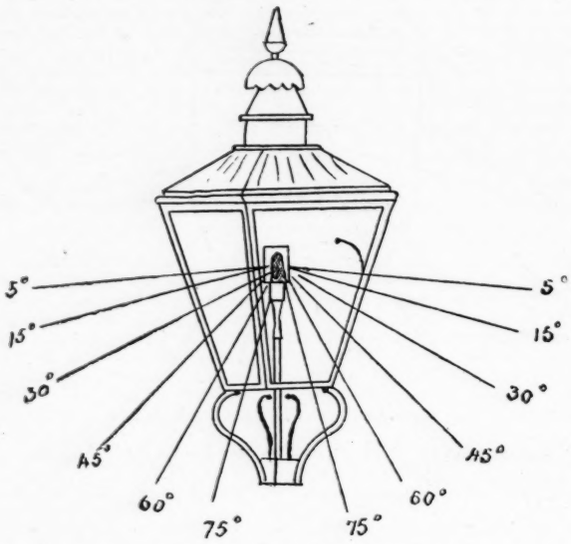
Comments on Electric Lighting.—The lamps tested were selected, not with reference to their condition or appearance, but wholly by reason of their individual situation. A lamp with a non-reflecting back-ground, with a sufficiently long run of space in front to permit of the movement of the photometer over the necessary 200 odd feet, was in each case selected. As it is impossible to obtain a perfectly steady burning arc, and as in every case some fluctuations are observable, the readings on the photometer were continued over some little space of time, and these readings were averaged.

I must express my admiration for the design and selection of the type of arc lamp used in Edinburgh. The steadiness of light is very satisfactory; and the light at the angles approaching the horizontal is far greater than in many types of lamps. It must be observed that the value of a lamp for street lighting is not measurable by its mean hemispherical intensity. The bare arc invariably gives its greatest results at angles from 40° to 50°, but at 5° and horizontal the light is very small.

With a gas incandescent lamp, the greatest light is, of course, horizontal to the mantle and the depressed degrees from it; and this affords an advantage over arc lighting in most cases. But the arc lamps used in Edinburgh afford a very considerable light at the longer distances, and thus must be looked upon as eminently satisfactory. In fact, the electric lighting of the city can be spoken of in terms of highest praise. The judgment shown in the placing of the lamps, and the efficient manner in which

Similar Lamp, Gillespie Crescent.

θ±	Candle Power.	Light on Ground in Foot Candles.	Equal to Candle held at	Distance from Column.
75	4·389	·036	5·24 feet	2 7 feet
60	10·56	·058	4·12 ,,	5·98 ,,
45	9·14	·031	5·6 ,,	10·5 ,,
30	10·78	·011	9·48 ,,	25·5 ,,
15	7·06	·001	31·6 ,,	38·8 ,,
5	11·40	·00009	—	119·7 ,,



THREE-FEET INCANDESCENT GAS-LAMP.

3-ft. Incandescent Gas-Lamp, Moray Place, opposite No. 3.

75	19·23	·121	2 8 feet	2·7 feet
60	43·4	·201	2·22 ,,	5·98 ,,
45	68·6	·167	2·44 ,,	10·5 ,,
30	69·5	·066	3·8 ,,	25·5 ,,
15	69·18	·012	9·1 ,,	38·8 ,,
5	68·59	·0005	44·7 ,,	119·7 ,,

3-ft. Incandescent Gas Lamp, Moray Place, opposite No. 40.

75	3·56	·021	2·8 feet	2·7 feet
60	11·22	·050	4·4 ,,	5·98 ,,
45	13 76	·037	5·19 ,,	10·5 ,,
30	16·86	·016	7·8 ,,	25·5 ,,
15	18·91	·0028	18·8 ,,	38·8 ,,
5	32·5	·00025	63 ,,	119·7 ,,

3-ft. Incandescent Gas-Lamp, Moray Place, opposite No. 41.

75	26·05	·156	2·52 feet	2·7 feet
60	45·05	·204	2·21 ,,	5·98 ,,
45	71·18	·173	2·4 ,,	10·5 ,,
30	69·5	·061	4·06 ,,	25·5 ,,
15	47·5	·0059	12·9 ,,	38·8 ,,
5	62·6	·00046	46·6 ,,	119·7 ,,

3-ft. Incandescent Gas-Lamp, Heriot Road, opposite India Street.

75	6·446	·047	4·5 feet	2·7 feet
60	19·93	·121	2·8 ,,	5·98 ,,
45	25·77	·08	3·5 ,,	10·5 ,,
30	36·46	·043	4·7 ,,	25·5 ,,
15	29·66	·005	14·14 ,,	38·8 ,,
5	33·67	·00019	72·54 ,,	119·7 ,,

3-ft. Incandescent Gas Lamp, Heriot Road, next Lamp.

75	6·446	·046	4·62 feet	2·7 feet
60	20·113	·121	2·8 ,,	5·98 ,,
45	25·99	·08	3·5 ,,	10·5 ,,
30	37·57	·039	5·05 ,,	25·5 ,,
15	32·35	·004	15·8 ,,	38·8 ,,
5	33·67	·00019	72·5 ,,	119·7 ,,

3-ft. Incandescent Gas-Lamp, King's Road and Portobello Road.

75	26·56	·125	2·82 feet	2·7 feet
60	44·78	·207	2·19 ,,	5·98 ,,
45	37·83	·112	2 98 ,,	10·5 ,,
30	46·24	·048	4·52 ,,	25·5 ,,
15	42·04	·006	12·88 ,,	38·8 ,,
5	37·72	·00029	58·7 ,,	119·7 ,,

2-ft. Gas-Lamp, Incandescent, St. Stephen's Street, opposite No. 88.

75	15·94	·08	3·5 feet	2·7 feet
60	14·77	·07	3·7 ,,	5·98 ,,
45	25·89	·073	3·67 ,,	10·5 ,,
30	27·27	·026	6·16 ,,	25·5 ,,
15	16·50	·002	22·36 ,,	38·8 ,,
5	32·83	·00018	74·5 ,,	119·7 ,,

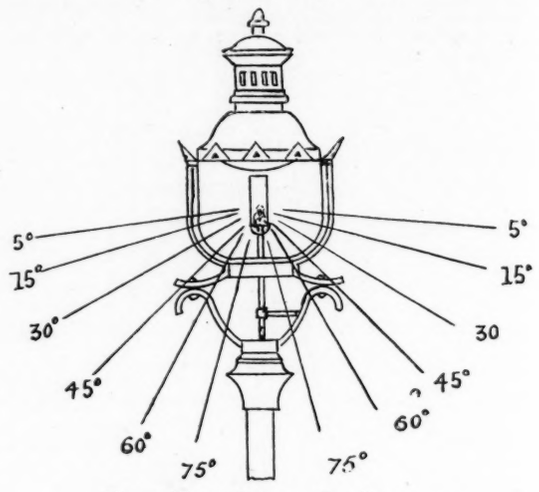
2-ft. Gas Lamp, Incandescent, St. Stephen's Street, by Theatre.

75	17·19	·166	2·45 feet	2·7 feet
60	19·35	·077	3·5 ,,	5·98 ,,
45	26·22	·073	3·67 ,,	10·5 ,,
30	27·65	·026	6·1 ,,	25·5 ,,
15	18·35	·00259	72·5 ,,	38·8 ,,
5	35·09	·00019	—	119·7 ,,

2-ft. Gas-Lamp, Incandescent, Plainstone Close.

θ±	Candle Power.	Light on Ground in Foot Candles.	Equal to Candle held at	Distance from Column.
	·70	·6096	10·19 feet	12·4 feet from bracket

(Broken Mant'e.)

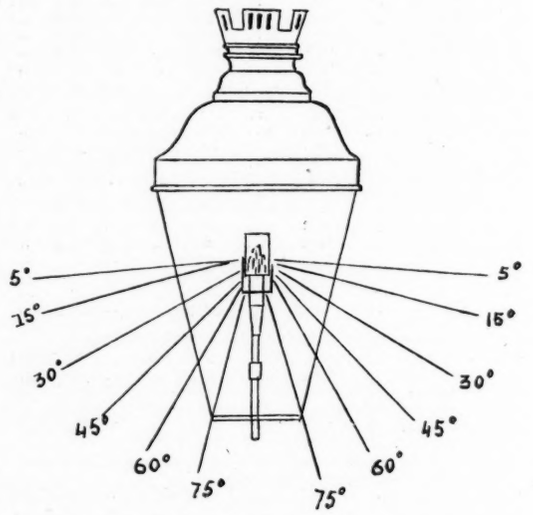


THREE-FEET GERMAN GAS-LAMP.

3-ft. Gas Lamp, Incandescent, German Lamp, Queensferry Road.

75	4·79	·035	4·2 feet	2·7 feet
60	15·16	·093	3·2 ,,	5·98 ,,
45	23·01	·078	3·5 ,,	10·5 ,,
30	34·58	·036	5·2 ,,	25·5 ,,
15	33·66	·004	15·8 ,,	38·8 ,,
5	32·90	·00018	74·5 ,,	119·7 ,,

(Mantle frayed and in constant movement by the wind.)



FOUR-FEET VENTILATING GAS-LAMP.

4-ft. Gas-Lamp, Incandescent, Middle Meadow Walk.

75	33·91	·272	1·91 feet	2·7 feet
60	36·79	·228	2·09 ,,	5·98 ,,
45	49·67	·182	2·34 ,,	10·5 ,,
30	59·13	·074	3·69 ,,	25·5 ,,
15	98·60	·017	7·6 ,,	38·8 ,,
5	115·77	·0008	35·35 ,,	119·7 ,,

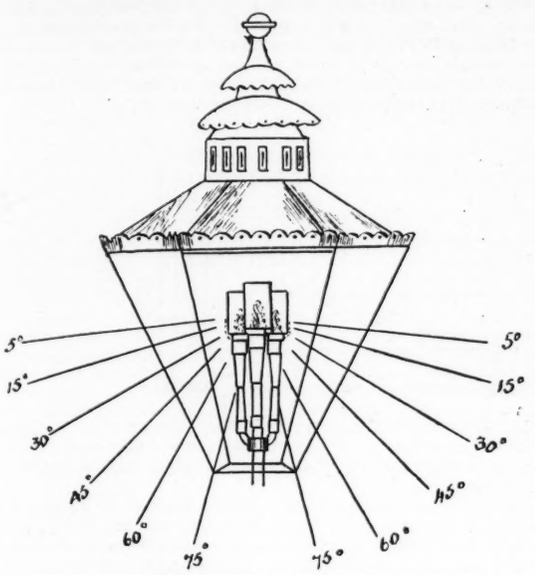
4 -ft. Gas-Lamp, Incandescent, Middle Meadow Walk, next lamp.

75	33·84	·27	1·9 feet	2·7 feet
60	38·09	·23	2·08 ,,	5·98 ,,
45	49·67	·20	2·2 ,,	10·5 ,,
30	63·52	·08	3·4 ,,	25·5 ,,
15	98·60	·017	7·4 ,,	38·8 ,,
5	123·43	·0008	35·3 ,,	119·7 ,,

4-ft. Gas-Lamp, Incandescent, Middle Meadow Walk, next lamp.

75	33·90	·27	1·9 feet	2·7 feet
60	37·98	·235	2·06 ,,	5·98 ,,
45	49·74	·202	2·22 ,,	10·5 ,,
30	59·80	·075	3·5 ,,	25·5 ,,
15	98·64	·0176	7·51 ,,	38·8 ,,
5	109·41	·0007	37·7 ,,	119·7 ,,

they are supplied with current, are especially noticeable. The results of some of the lamps do not come up to the figures one would expect from 10-ampere lamps; but, on the whole, the arc lighting compares very favourably with that of other towns. At Portobello, however, the lamps are distinctly inferior in power. Apparently of the same type, they did not in any case approach the light results which should have been obtained. Considerable laxity was observed in the matter of switching off the half-night



HEXAGON GAS-LANTERN.

9-ft. Gas-Lamp, Incandescent, Melville Drive.

θ±	Candle Power.	Light on Ground in Foot Candles.	Equal to Candle held at	Distance from Column.
75	20·38	·087	3·43 feet	2·7 feet
60	43·17	·134	2·73 ,,	5·98 ,,
45	72·30	·126	2·81 ,,	10·5 ,,
30	109·41	·069	3·76 ,,	25·5 ,,
15	179·02	·015	8·1 ,,	38·8 ,,
5	265·69	·0005	44·7 ,,	119·7 ,,

9-ft. Gas-Lamp, Incandescent, North Middle Meadow Walk.

75	21·29	·09	3·33 feet	2·7 feet
60	43·17	·134	2·73 ,,	5·98 ,,
45	70·59	·123	2·84 ,,	10·5 ,,
30	108·99	·068	3·84 ,,	25·5 ,,
15	168·48	·014	8·4 ,,	38·8 ,,
5	264·06	·0005	44·7 ,,	119·7 ,,

(Mantles in fairly good condition.)

lamps—they, on some occasions, burning well into the morning, and on others being extinguished promptly at 11.30.

COMMENTS ON GAS LIGHTING.

The Flat-Flame Lamps are apparently obsolete; and though some were tested, yet it is obvious that their replacement by some other system must take place in the near future. These lamps were well cleaned; and the very best results possible were obtained from the quantity of gas consumed in the flat-flame burners used.

Incandescent Gas-Lamps.—The fact that most of these are fixed on the columns originally placed for the flat-flame lamps, would lead one to expect that the lighting would be most brilliant. Such, however, was not the case. They are a great improvement, naturally, on the old flat-flames; but in most cases nothing but disapproval can be expressed of them as specimens of incandescent gas lighting. The types of lanterns are good, and no fault can be found with the burner and mantle used. The fixing of the lantern and inefficient maintenance are, in my opinion, to blame for the fact—which I state definitely—that at least 40 per cent. of the gas expended in these lamps is wasted.

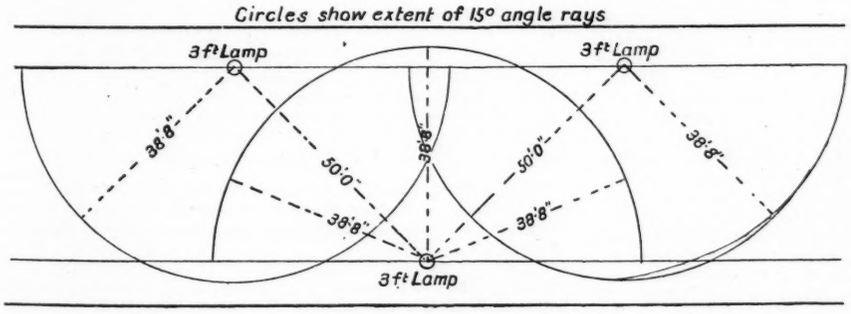
No account, or very little, appears to be taken of the necessity of keeping the lanterns wind-tight, if they are to contain mantle burners; and the large apertures in the bottoms, perhaps an inch in diameter, through which passes a small supply pipe (⅜-inch brass in some instances), could easily be stopped by loose washers running on the stand-pipes. In many cases, the glass bottoms are wholly absent—in still more, partially gone. The result is that one may walk down street after street without finding a mantle in good condition. As a concrete example, on the morning of July 29, I left the Caledonian Hotel, and turned down the first street in which incandescent lamps were fixed. This was Alva Street. There are ten lamps in this street—nine of the mantles were badly broken, and only one at all passable. The lamps are square lamps. I walked thence to Queensferry Road, where the lamp called the "German lamp" is used, and found 29 bad mantles and 9 good. In Gloucester Place, 10 were bad and 4 good. By referring to the tests at Moray Place, where three lamps forming a triangle were tested, it will be seen what a vast difference is caused by this matter of mantle maintenance. At 45° angle, we have 68 candles, 13¾ candles, and 71 candles.

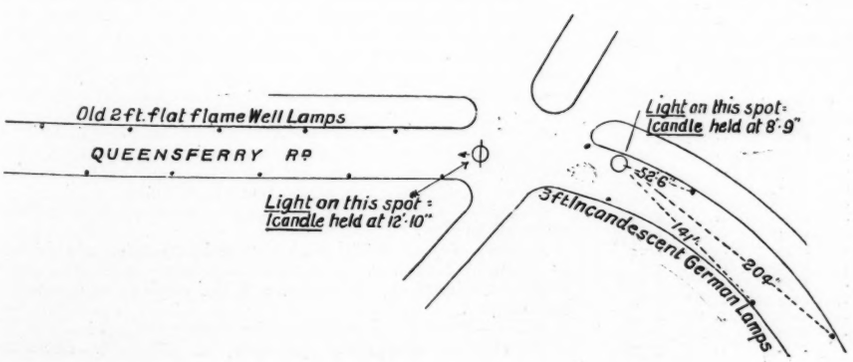
My tests lead me to state that a 2-foot incandescent gas-lamp should yield, at its best angle, with Edinburgh gas, 40 candles; a 3-feet lamp, 70 candles; and a 4-feet lamp, 115 candles.

No doubt the Gas Commissioners expend large annual sums upon the gas for these incandescent lamps, yet for the want of a small additional sum for mantles and maintenance—a question of £100 or £200—at least 40 per cent. of the large cost is thrown away. I must state that in any London district where the maintenance is in the hands of a private contractor, the local authorities would not for a single week tolerate the condition of things with regard to incandescent gas-lamps which prevails in Edinburgh.

General Diffusion of Light.—Referring again to the table of lamp tests, it was ascertained by measurement that angle-ray 15° strikes the ground in every case at a distance overlapping the similar angle from the next lamp, and thus this is the most important angle to be considered in point of general diffusive effect. The varying widths of the streets render it impossible to give any useful data as to the general effect between lamps, as such light is in every case greater than that attributed to any one lamp. The figures given, however, enable the lighting effect to be estimated with great practical accuracy for any street.

I will instance a street in which the incandescent gas-lamps have an oblique distance between them (from side to side of the road) of 50 feet. The circles are drawn to scale at 38·8′ from each lamp, that being the extent of the 15 degrees angle ray. It is obvious that at the overlapping portions of these circles the ground is receiving the same amount of light from each; and thus the foot-candles found to be yielded at 15 degrees by each lamp is doubled. In addition to this, each lamp is providing further light at its more acute angles, all of which is adding its effect to the general illumination.

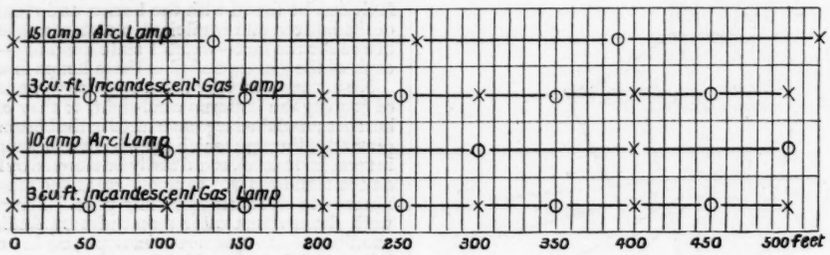



Old 2ft. flat flame Well Lamps
QUEENSFERRY RD
Light on this spot = 1candle held at 12'10"
Light on this spot = 1candle held at 8'9"
58'6"
3ft. Incandescent German Lamps

How these distant angles sum up, is to a large extent dependent upon the plan of the street. I give here a sketch of part of Queensferry Road, with the measurement of its general diffused light in two directions; the one being lighted by the old flat-flame 2-feet burners, and the other by incandescent gas. The long vista of small lights towards the Forth provided a series of infinitesimal units, all of which had a perceptible effect on the lighting of the photometer disc—all being focussed on the screen. In the other direction, owing to the curvature of the road, only a few of the incandescent lights were visible, and thus no diffusive effect was received from distant lights.

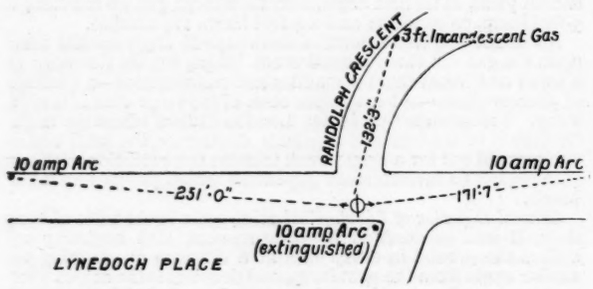
As will be seen, however, from the "comparisons" given at the commencement of this section, print can be read with the light of a candle held at a distance of 10 feet. This is equal to 0·01 foot-candle; and as in every case of a normally-burning lamp with a mantle in comparatively fair condition the ray reaching

half-way to next lamp is invariably more than double, it follows that in every street where incandescent gas is used, the roads are admirably lighted, even with the lanterns in their imperfect condition. In fact, if the consumption of gas of each were reduced to 2 feet, and the mantles and lanterns properly maintained, the lighting would still be excellent—as good, in most cases, as at present. The comparative effects of the electric and gas lamps, taking good specimens of each, are as follows—X representing the lamp and O the point where the light equals 0·01 foot-candle. The vertical divisions equal 10 feet of distance. Thus, three 15-ampere lamps equal six incandescent; and three 10-ampere lamps equal five incandescent—approximately.

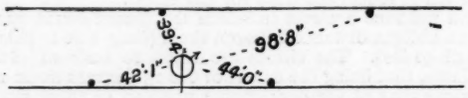


It must be borne in mind, however, that the greater height of the electric lamps gives the rays forming the more acute angles with the ground a further reaching effect, and thus the more distant lamps afford more useful aggregate distance light than the shorter gas-columns can do; and I therefore should have no hesitation in stating that the 10-ampere lamps could do the work of three times the number of 3-feet incandescent gas-lamps in fairly straight streets where the height of the electric columns gives that system the advantage I mention.

The following diagram will show this far-reaching effect of the electric lamps:—



The light in the photometer from the three sources of light equalled that of a candle held at 7 ft. 2½ in. A similar effect of gas lighting is shown thus (3-feet incandescent lamps, in bad condition):—



The light on the ground at this point equalled that of a candle held at 5 ft. 11½ in.

Public Stair Lighting.—The lights are invariably of one type, an extremely well-made metallic Peebles governor, in a special elbow fitting; such governor being adjusted to pass 1½ or 2 cubic feet per hour.

The course pursued in this test was to visit the stairs at night, between 11 and 1 o'clock a.m., to test and record the pressure with the lights going, remove the selected burner, and replace same with a new fitting. Each burner, as removed, was carefully labelled with its origin and the pressure. The testing proper was conducted at the South Morningside testing-station, where the high pressure enabled every condition to be faithfully reproduced. The burner was mounted on the photometer saddle, and the gas passed to it through the photometer meter and a governor; the latter being adjusted in each case until the pressure-gauge showed exactly the pressure recorded as having been influencing the burner at the time of removal from the stairs. Thus, the exact consumption of gas was indicated during the examination of the burner for its illuminating power; and this illuminating power was ascertained with the burner-flame burning at exactly the same pressure as prevailed at the time of inspection.

	Cubic Feet.	Illuminating Power Candles.
9, Leith Street Terrace	4·22	10·70
3, Greenside Row	1·50	2·94
31, Broughton Street	1·80	3·63
31, North Back of Canongate	1·25	2·04
175, Canongate	2·10	2·85
13, St. John's Street	1·30	2·08
1, St. John's Hill	1·25	1·85
83, St. Mary's Street	1·30	1·92
South Foulis Close	1·66	4·83
Craig Close, High Street	1·30	1·81
94, Grassmarket	2·55	3·84
25, Corporation Buildings, Portobello	1·25	1·92
12, Bath Street, Portobello	3·48	2·27
151, High Street, Portobello	1·79	3·57

It will be seen at once that only two governors out of fourteen were out of action; and considering the position and the rough usage to which many of them must be subjected, this result must be considered good.

It is difficult to suggest any better method of lighting these stairs, as the area over which light may spread from any one burner is so limited as to render a larger source of illumination practically of no greater effect. In my opinion, these stair-lights are well designed for their work, and well fitted and maintained.

With some diffidence, I suggest that on some of the better class of stairs, where the tenements are obviously occupied by persons who would appreciate the change, a small lantern might be used to enclose the light; thus ensuring a steadier illumination when the lower door is open. With this exception, I do not consider any improvement possible, and fail to see that any increase in the consumption of gas would attain a useful end. It is very apparent that constant care is required in maintaining the lights; and it is obvious such care is exercised—in marked contrast to the want of care shown in maintaining the incandescent street lights.

Calorific Power of Gas.—The tests for this important quality were carried out on 26 occasions; the highest result being at Portobello (729 B.T.U. per foot of gas burned), and the lowest (667 B.T.U.) at the Synod Hall.

	B.T.U. per Cubic Foot.		B.T.U. per Cubic Foot.
July 6—Synod Hall	667	July 15—Portobello	729·0
,, ,,	677·2	July 16 ,,	688·0
,, ,,	695	,, ,,	709·0
July 9 ,,	692	,, ,,	709·1
,, ,,	701	July 17 ,,	690·5
July 11—Portobello	719	,, ,,	703·2
,, ,,	706	,, ,,	696·3
July 12 ,,	710	July 18 ,,	707·4
,, ,,	697	July 20—Morningside	666·6
July 13 ,,	699	,, ,,	679·2
,, ,,	697	July 21 ,,	683·3
July 15 ,,	689	,, ,,	681·0
,, ,,	718	July 22 ,,	678·0

Specific Gravity of Edinburgh Gas.

Date. Station.	Sp. Gr.	Date. Station.	Sp. Gr.
July 4 Synod Hall	·560	July 5 Leith Docks Police Stn.	·559
,, 4 ,, ,,	·560	,, 12 Portobello	·565
,, 5 ,, ,,	·604	,, 13 ,,	·582
,, 5 ,, ,,	·591	,, 14 ,,	·569
,, 9 ,, ,,	·552	,, 16 ,,	·588
,, 5 Tanfield Gas-Works	·589	,, 17 ,,	·582
,, 5 Stockbridge Police Stn.	·590	,, 20 Morningside	·603
,, 5 Granton Police Stn.	·594	,, 21 ,,	·583

Conclusions.

Report.—From the figures detailed in the preceding pages, and from constant observations for thirty consecutive days, and from sunset to dawn on sixteen nights, I am able to reply to the terms of reference:

Query.—What is the illuminating power of the gas supplied to the city of Edinburgh, and what loss (if any) is incurred in distribution from Granton works?

Answer.—The illuminating power of the gas supplied during the month of July, 1905, was, in my opinion, over 24 candles. The loss in illuminating power during its journey to the Portobello testing-station and in the store holder was 2½ candles. The range of results was 4·4 per cent. below to 2·4 per cent. above the average—a variation well within reasonable limits. The loss at Synod Hall was three-quarters of a candle. The range of results was 13 per cent. below to 18 per cent. above the average—an abnormal variation. The loss at South Morningside was 1¼ candles. The range of results was 5·4 per cent. below to 4·1 per cent. above the average—a variation well within reasonable limits.

Query.—At what pressure is such gas delivered at the various parts of the city?

Answer.—At a minimum of 2 inches and a maximum of 4¼ inches, as shown by diagrams. I consider the pressure of the gas—especially considering the hilly nature of the city—to be eminently satisfactory.

Query.—What is the voltage of the electric current?

Answer.—In excess of 230 volts, as shown by diagrams.

Eminently satisfactory in the centre of the city, and showing great variations in the Portobello district.

Query.—What is the consumption and illuminating power of the public stair lights?

Answer.—The consumption varies from 1¼ feet of gas per hour to 4·22 feet; the light varying according to the condition of the burner, as shown in the table. The lights are very well maintained.

Query.—What is the illuminating power of the various types of street lights, and what the general condition of the lighting apparatus? What is the general lighting effect?

Answer.—This is replied to fully by the tables of tests. The maintenance of, and duty from, the electric lamps in the city is eminently satisfactory. The duty from the electric lamps in Portobello is not so good. The duty from the incandescent gas-lamps in the city is good where the maintenance is good; but in most cases the maintenance is very unsatisfactory. If the maintenance were satisfactory, the ratio of arc lamps to incandescent gas-lamps, set out in the diagram already given, would be considerably altered in favour of the gas-lamp.

In conclusion, the tests were carried out with the utmost strictness and fairness; none being rejected on account of improbability. As far as possible, all were made without the knowledge of the Electric and Gas Engineers. On one occasion Mr. Herring visited the Synod Hall testing-station, but towards the conclusion of the tests there, and by permission of the Town Clerk. The subsequent testing-places were settled upon, and opened, without any information being afforded as to their situation. The street tests were carried out without any person other than myself being aware of the district to be visited, and in no case was a district visited on consecutive nights. Any of the tests here recorded can be repeated and confirmed under similar conditions.

I have the honour to be, &c.,

(Signed) JNO. F. SIMMANCE.

Every test here recorded was carried out by me personally with the assistance of Mr. James Foreman, my Chief Photometrist.

APPENDIX.

Apparatus Used in Obtaining the Forementioned Figures.—60-inch Letheby steel tube photometer bar, National Physical Laboratory pattern. Scale verified by comparison with Board of Trade standard. Simmance-Abady "Flicker" photometer head. Twenty-four-hole 25-candle argand burner, with 5-inch by 1⅝-inch chimney. No. 7 standard batswing burner, to Board of Trade standard dimensions. Harcourt ten-candle standard pentane lamp, verified by the National Physical Laboratory. One-twelfth cubic foot standard photometer meter, verified by comparison with Board of Trade standard. Long-beam balance governor. King's pressure gauge, showing hundredths of an inch pressure. Candle balance, as prescribed by Sales of Gas Act. Standard spermaceti candles. Direct current voltmeter. Alternating current voltmeter. These were specially prepared and calibrated by Messrs. Nalder Bros., and verified before removal from London, and again immediately on return. [NOTE: The direct-current voltmeter was found on its return to be reading 1 volt too low throughout; but it is considered that this slight derangement was caused in transit to London, and the figures stated therefore stand as read.] Simmance-Abady standard gas-calorimeter, with verified thermometers, and cistern and pump. The photometer meter and governor were used in these tests. Specific gravity diffusion apparatus, the comparison being moist gas in terms of moist air (=1). Wet and dry bulb thermometer. Special German expansion hygrometer. Standard verified barometer. Standard thermometer. Thirty-hour registering pressure apparatus. 8-inch water-tube pressure gauge. Electric glow lamps of 16-candle power, all well run. Street photometer, with pentane standard and "Flicker" photometer head, mounted on four-wheeled carriage.

PERSONAL.

A new gas-works is about to be erected at Polmont, in Stirlingshire, by a Company formed for the purpose of introducing a gas supply for the district. The Company have appointed Mr. JAMES CAMPBELL, who is at present in the office of the Dunfermline Corporation Gas-Works, to be their Manager. Mr. Campbell has been trained at Dunfermline, under Mr. H. Pooley and Mr. A. Waddell, and has been on the short-list for more than one appointment as Manager. He is to design the buildings and erect the plant for the works at Polmont.

We regret to learn that Mr. C. E. BALL, the Manager and Secretary of the Ilfracombe Gas Company, has been compelled, owing to the condition of his health, to relinquish his position. It may be remembered that on the occasion of the opening last July of the new works of the Company, the responsibility for the carrying out of which had rested practically solely upon him, he was too unwell to stay through the whole of the proceedings. It is unfortunate that he has had to give up just now, when the new works would have made the discharge of his duties much easier in the future. He has been with the Company for 23 years; and on the occasion above referred to the Chairman (Mr. R. Lake) highly eulogized his services, which we are assured, by one who has intimately known him for a long time, the Directors are very sorry indeed to lose.

Mr. EDWARD JONES, the Gas Engineer and Manager of the Pontypridd Urban District Council, has been appointed Gas Engineer and Secretary to the Burslem Corporation, in succession to Mr. Henry Peaty. He was educated at Liverpool College, and served his articles as an engineer with Mr. W. Bruce, of that city, who designed and constructed works for the Gas Company. He afterwards entered the Company's service under Mr. William King, and was placed in charge of the machinery and apparatus department. From Liverpool he went to Sligo, as Assistant-Manager of the Gas Company, and subsequently obtained the position of Gas Manager to the Ellesmere Local Board. After five years' service, he went to New Mills as Engineer and Manager of the gas-works, and while there was entrusted, in conjunction with Mr. Henry Bancroft, of Manchester, with the preparation of a scheme of water supply. He moved from New Mills to Pontypridd in 1900. Mr. Jones is a member of the Institution of Gas Engineers, and Vice-President of the Wales and Monmouthshire Gas Institution.

Mr. H. GAGE EDWARDS, who was for nearly six-and-a-half years the Assistant Engineer at the St. Albans Gas and Water Works, has lately left England to take up a position with the Colombo Gas and Water Company, Limited. Previous to going to St. Albans, Mr. Edwards was an articled pupil at the Gorleston and Southtown Gas-Works for five years, and assistant for one year. During this time he obtained first-class certificates in Gas Manufacture, Chemistry, and Building Construction. Mr. A. F. Phillips, who is Engineer to the St. Albans Gas and Water Companies, as well as Chairman of the Colombo Gas and Water Company, had pleasure in recognizing Mr. Edwards's ability and attention to business by recommending him for the Colombo appointment. Mr. Edwards has already received tangible proofs of good feeling from those with whom he has been connected. The employees at Gorleston presented him on leaving with a clock; while on his departure for Colombo those at the St. Albans Gas-Works gave him a handsome camera, and those at the water-works a couple of books on engineering subjects. He also received presents from Mr. A. F. Phillips and some of the residents in St. Albans. The esteem in which he was held by the men at the gas and water works was shown by their engaging the City Band to escort him to the station.

OBITUARY.

The death occurred rather suddenly, on Friday, the 8th inst. at his residence at Redhill, of Dr. CLAIR JAMES GRECE, who had held the position of Town Clerk of Reigate since Jan. 4, 1864. Deceased was a Director of the East Surrey Water Company and a life member of the British Association. He was 75 years of age.

An old official of the Gas Department of the Birmingham Corporation passed away on Monday last week in the person of Mr. E. D. GODDARD. Deceased was originally in the office of the Staffordshire Gas Company, having entered the service as far back as 1859, and was taken over on the transfer of the undertaking to the Corporation. In his capacity of Office Superintendent, he was widely known and respected by professional men in the city; while he was held in high regard by his colleagues upon the staff. He retired under the operation of the superannuation scheme in 1899. For more than a year he had been in failing health, and became seriously ill six months ago. He had been compelled to remove to Bournemouth, where he died in his 78th year.

Tar Paving for Roadways.—At the recent meeting of the Tramway and Light Railways Association, Mr. W. L. Green read a paper on "The Paving of Roadways." After dealing with the famous ancient roads of Egypt, Greece, India, and Italy, he came down to the time of Telford, who laid out no less than 920 miles of roadway. Since his period, Mr. Green said, there had been little change in the manner and method of paving, till they came to the time when modern requirements demanded qualities and conditions not previously insisted on. Tar macadam was laid in Nottingham so far back as 1840; but the method of doing the work had been greatly improved. Its advantages over ordinary macadam, put briefly, were economy in unkeep, the ensuring of a solid surface, the prevention of dust (and consequently mud), and increased facility of traffic.

The Use of Steel Piling in making repairs to dams is well shown by the methods adopted to raise a structure at Newaygo (Mich.), which develops at present a head of about 22 feet. According to "Engineering Record," this is an earth dam, and it will be raised so as to give a working head of about 32 feet. In order to have the structure safe under this additional pressure, piles are being driven on the up-stream side, to act as a core for the enlarged structure. The piles are 18 and 20 feet long, and are driven into hardpan. Clay is being filled in over the piling and in front of it, so that an impervious and stable structure will be secured. It is stated that the use of the steel piling has made it unnecessary to draw the water out of the pond, build coffer-dams, excavate to hardpan, and put in a concrete core wall, all of which would have had to be done had steel piling not been available.

GAS-FIRES AND COKE AND SMOKE ABATEMENT.

The Royal Sanitary Institute and the Coal-Smoke Abatement Society must feel very gratified and encouraged with the success that last week attended the conference on smoke abatement and the exhibition of appliances tending to promote that desirable object. The conference opened on Tuesday and continued until Friday; the meetings and the exhibition being held in the new Hall of the Royal Horticultural Society, Vincent Square, Westminster. On the opening night, there was great disappointment and manifest regret that the Duke of Fife was unable through illness to be present to preside at the inaugural meeting and to declare the exhibition open. To complete the chapter of disappointment and regret, indisposition also claimed the absence of the President (Sir Oliver Lodge, F.R.S., D.Sc., LL.D), whose address had been anticipated with the liveliest interest. However, Sir Oliver, before the meeting, was able to send a much curtailed account of the extempore deliverance he had hoped to personally make; and this Sir William B. Richmond, K.C.B., who presided, read—prefacing it with statements of his own. His audience was a distinguished one, composed of representatives of science and the arts, technical organizations, and municipal authorities.

The Chairman first explained the objects of the Conference, the foremost of which was to discuss practical methods that might be adopted for abating the evils arising from the production of smoke, of which there had been such a convincing demonstration during the two preceding days. He also described the work in which the Sanitary Institute and the Smoke Abatement Society had been engaged in connection with smoke prevention; and quoted from some of his own writings on the general subject. Following this he read the

ADDRESS BY SIR OLIVER LODGE.

The Objections to Gas-Fires Considered.

In the course of his remarks, Sir Oliver said that coal smoke contained many other products beside coal tar and asphalte and manures, and other useful material. It contained sulphurous acid—an ingredient of the most noxious character, and which speedily became oxidized into oil of vitriol. Speaking of remedies, Sir Oliver said that one that had been suggested was the electrification of the air on a large scale, but it would be too expensive to consider as a permanent method of dealing with town fog caused by imperfect combustion. It was expensive to produce a town fog; and it would be expensive to dissipate it. The double expense ought not to be tolerated. The right way of dealing with a town fog was not to produce it. If it were only country mist, it would not be nearly so deleterious; and it would soon be dissipated. But the fog which contains products of imperfect combustion was, in the first place, far denser; in the second place, far more readily formed; and, in the third place, much more permanent.

In connection with the problem of combustion, there were three things to be attended to in: (1) Purification of the material to be consumed; (2) the proper means of effecting its complete combustion under conditions of easy regulation, and avoidance of dust or dirt; (3) the utilization of the heat due to that combustion without waste. The scientific and satisfactory combustion of crude coal as it was picked out of the pits was an impossibility. It must first be subjected to some chemical treatment. Its solid and its gaseous constituents ought to be separated from one another. The solid constituents in the form of coke, when properly made, were of exceeding value for smelting and manufacturing operations; and it was the solid portions which would contain the ash and dirt. Processes involving the use of solid fuel should not be carried on in a big city, but should group themselves round a coal-field, so that the cost of carriage might be small. The gaseous product, on the other hand, readily lent itself to purification and chemical treatment, and could then be easily transmitted to any distance and there burned in a scientific and proper manner under easy regulation; being turned on and off as wanted.

Another scientific method of dealing with coal, said Sir Oliver, was to turn almost the whole of it into gas—*i.e.*, all, except the ash—by a judicious supply of air and steam; and then to utilize the whole of this gaseous product, purified up to a certain point. Gas of this kind—sometimes called water gas, sometimes producer gas, and sometimes Mond gas, according to various details of its preparation—could be made very cheaply and plentifully. But its large amount made the purification of it rather more difficult; and, moreover, it had not the same heating power, bulk for bulk, as coal gas proper possessed, without so great an admixture of nitrogen. However, all these details were matters for detailed consideration. There were advantages and disadvantages in every plan that had been suggested; but there was not one plan for the combustion of gas that did not far eclipse the uncivilized and essentially savage method of heaping a pile of crude coal together, and setting a light to it.

Sir Oliver next considered what the burning of coal entailed in labour from the pit to the carting of the ashes away. It was a long and troublesome series of operations even apart from the fouling of the air, which was the worst condition of all. Then he discussed what the supply and use of gaseous fuel would entail: (1) The getting of the coal; (2) the conversion of it into gas either at the bottom of the pit or near its mouth; (3) the conveying away of the coke and the manure products to where they were wanted; (4) the transmission of gas in great pipes to the distant town just as water was now transmitted, with occasional pumping-stations as might be necessary, driven by the power of a small portion of the same gas; (5) the underground distribution of all this fuel, and its utilization by the turning of a tap in a manner which would ensure complete combustion, with no smoke, no ash, no dirt, no trouble, and no residual product to carry away either in carts, clothes, or lungs. Against all these conveniences, they had to set the influential and constantly encountered parrot cry, "We do not like gas-fires." The people who said this did not realize that every coal-fire was to some extent a gas-fire, though it was a very bad one. When coal was put on, a quantity of it was necessarily turned into gas—impure and badly-made gas; but gas at any rate which, before long, caught light and flamed, burning with a smoky flame, but burning and giving what was called a coal fire, though it was really a gas-fire—the gas being made on the premises, and made badly, and only half burned, became mixed with carbonic acid from the red-hot material below. There was, of course, some justification for the statement; and the justification was that, when they spoke of gas-fires, they thought of the imperfect arrangements at present in vogue for burning gas at 3s. and 3s. 6d. per 1000 cubic feet—burning very little of it therefore, and burning that imperfectly, sometimes without causing sufficient draught in the chimney to carry away the products of combustion, which therefore entered the room. When the products from a coal-fire entered the room, people said the chimney smoked, and regarded it as intolerable; but when the same thing happened to an imperfect gas-fire, they were liable to abuse gas-fires in general, as if the defects were a necessary condition of their existence. Moreover, some people went so far as to put a gas-fire into a chimney which had troubled them by smoking, for the products being invisible, and somewhat less noxious than the coal-fire products, they thought they might be tolerated, though at the same time the reputation of the gas-fire suffered irretrievably. None of these things would happen if gas were supplied in large quantities for use all day for cooking and heating purposes at a very low price. Sufficient would then be burned to make the chimney draw properly; and the general use of such arrangements would stimulate invention to the production of appropriate gas-fires—such, for instance, as some of those used in Pittsburg, where natural gas is, or was, cheaply available, and no one thought of burning coal.

But now what, asked Sir Oliver, were the conditions of complete combustion? First of all, there must be no cold surfaces to interfere with ignition. Gas must be raised to a certain temperature before it would ignite, and the simple theory of a flame was that the combustion of each portion had to ignite the next; and it could not do this if the temperature was lowered beyond a certain point by solid conductors introduced into the flame. In any domestic grate there was far too much iron. There ought by rights to be none—nothing but a non-conducting material within reach of the flames. Otherwise the portion of the flame in contact with the good conductor was necessarily extinguished, whether visibly extinguished or not, and the material escaped unburned. Because the products which escaped up the chimney were invisible, it did not follow that there had been complete combustion. Many of the products of incomplete combustion were gaseous; and it was just as wasteful to allow chemically combustible material to escape unconsumed, as it was to allow heat to escape, when it had once been generated by combustion. This fact was, however, often forgotten; and so long as all the heat generated was utilized, it was thought that there could be no waste. On the contrary, there could be very much waste, and in many cases there was. The avoidance of cold surfaces in open fire-places and stoves was not difficult; and there was no excuse for them there, nor was it difficult to avoid them in manufacturing processes, such as the baking of pottery and other furnaces dealing with incandescent material.

But there was one great application where the introduction of cool surfaces into the flame seemed almost unavoidable—viz., the firing of boilers; and here Sir Oliver said it was to be hoped that gradually gas-engines would replace steam-engines, and enable them to dispense with the rather primitive and unsatisfactory arrangement of obtaining power by the boiling of water. One condition for complete combustion was the adequate supply of air unmixed with carbonic acid or other material. If enough air was not supplied, then the fire or the stove or the furnace became a sort of gas-retort; the only difference being that in the gas-retort no air was supplied at all, and the products were simply distilled away unburned. This happened in the early or black stages of a coal-fire; but it was especially liable to happen in closed stoves and in other furnaces with doors. The flame promptly went out; and the gas was distilled up the chimney. If the door was open, it might catch alight again with a small explosion. Consequently, the stoker took care not to open the door until the gas had all gone; and he was left with nothing but smouldering coke. Then he could open the door, and repeat the process. In boiler furnaces, however, there was this difficulty, that, if too much air was introduced, combustion was too perfect; and the flame had insufficient radiating power. Moreover, unless the air was previously warmed up as it ought to be, it exerted a considerable cooling influence; the cooling being mainly due to

the great bulk of nitrogen in proportion to the active ingredient of the air. The right way, indeed the only way, of conveying heat from a flame to a cool surface was by radiation. It was impossible to bring a flame into contact with a cool surface. The flame was extinguished where it touched, and a layer of non-conducting gas necessarily intervened, across which the heat could only pass by radiation. On this subject, in relation to boiler-furnaces, Sir Oliver made some extended remarks, and with them concluded his address.

The evening also embraced a paper by Dr. W. N. SHAW, F.R.S., on "Is London Fog Inevitable?" He concluded, from such evidence as we possess, that the abolition of coal smoke would cut off 20 per cent. of fogs altogether, that it would add most materially to the power of the sun to dissipate fogs, and thus indirectly reduce their duration. The abolition of the dirt and the restoration of something like our natural heritage of daylight would be incidental advantages, which are by no means unworthy of consideration.

Several votes of thanks were passed before the large audience separated.

THE GROWTH OF GAS COOKING AND HEATING IN LONDON.

Sir George Livesey on the Great Desideratum for the Prevention of Smoke.

The honour of being the Chairman at the first sitting of the Conference next morning fell to Sir GEORGE LIVESEY; and he opened the proceedings by delivering the following address, which is pregnant with information instructive and valuable not only to the public, but to the gas industry at large.

To induce an individual to change a long-fixed habit or practice is a very difficult matter, unless it can be shown to be decidedly to his interest and advantage. To change the habit or practice of the inhabitants of a great city can only be undertaken by enthusiasts, who must be gifted with exhaustless patience and perseverance; for at the best they cannot hope to see anything but a very gradual change. But there is hope for London; the abatement of its smoke has begun. To estimate the proportion of the smoke of London due to domestic fires is impossible. It is certainly very large and greatly in excess of that produced by factories, &c. On a still day even a few cottages will fill a country valley with smoke, as I once saw with astonishment; and I often see from a hillside overlooking the lower part of a town the great amount of smoke from a few hundreds of small houses. In fact, if domestic smoke could be abolished, that from factories would be found to be less than is commonly supposed, and would cause little trouble. Gaseous firing, the gas-engine, and the dynamo are potent agents for the diminution of factory smoke.

I can only suppose that my connection with the supply of gas in London is the reason why I have been asked to occupy the honourable position of Chairman at to-day's Conference, in order that the information bearing on smoke abatement possessed by the Gas Companies might be given, and possibly some indication of further steps in the direction of gaseous fuel that may be taken. If—and it is certainly a big *if*—a suitable gaseous fuel, at a low price, could be substituted for the bituminous coal now used so largely, the trouble would be ended. The improvement that has taken place during the last twenty years, much more in the later than in the earlier ten years, is due to the substitution of gas for coal by the general adoption of gas cooking-stoves by all classes, particularly wage-earners. The smoke from cooking is an old source of trouble, for the other day I found these quaint lines:—

> Observe how the chimneys
> Do smoke all about;
> The cooks are providing
> For dinner no doubt.
> From *Poor Robin's Almanack* (1695).

The following figures will show how this source of smoke is being diminished. I have been obligingly furnished by my friends—Mr. Watson, the General Manager of the Gaslight Company, and Mr. Stanley Jones, the Engineer of the Commercial Gas Company—with the number of cooking-stoves, &c., in their respective districts, so far as is known to them. I only give the statistics for the three Metropolitan Companies; but all the Suburban Companies are working on the same lines. Within the last ten or twelve years, by the introduction of the penny-in-the-slot meter, almost the whole of the wage-earning classes of London have been supplied with gas, whereas previously not one in a hundred used gas, for which there were two reasons—the cost of fitting up their houses, and the periodic collection of the gas accounts. The Gas Companies now fit up houses and tenements, providing meter, cooking-stove, pipes, fittings, and burners—all, including the gas, being paid for by the pennies put into the meter.

These figures are an under-statement; being only those known to the Companies as stoves let on hire or sold to consumers; but some consumers have purchased stoves of the makers. It will therefore be safe to say that of the 834,000 consumers supplied with gas by these three Gas Companies, about 70 per cent. or 584,000, use gas-stoves for cooking. The only reason why it is not 100 per cent. in the case of the slot-meter consumers is that, in a certain number of their habitations, a cooker cannot be fixed—sometimes because there is no place for it, and in other cases because the landlords will not permit it. One of the greatest and

Cooking-Stoves in Use in the Districts of the Three Metropolitan Gas Companies.

—	Ord. Consumers.	Cooking-Stoves.	Slot Consumers.	Cooking-Stoves.
Gaslight Company. .	252,273	101,545=40 p.c.	214,691	164,699=76 p.c.
South Metropolitan Company . .	108,305	82,370=76 p.c.	188,999	161,344=85 p.c.
Commercial Company.	25,000	9,000=36 p.c.	45,000	28,450=63 p.c.
Totals . .	385,578	192,915=50 p.c.	448,690	354,493=79 p.c.

—	Total Consumers.	Total Cooking-Stoves.
Ordinary	385,578	192,915 = 50 p.c.
Slot meter	448,690	354,493 = 79 p.c.
Grand total . .	834,268	547,408 = 65 p.c.

best of the philanthropic trusts for a long time refused permission to fix a gas-stove in their buildings; and now that the objection has been overcome, it is found that, in a large proportion of their tenements, there is no place for the gas-cooker—they having provided good ordinary ranges to burn solid fuel.

From the King's palace to the cottage or the small tenement of the workman, from the small room occupied by a single man or woman to the largest business and other establishments where hundreds are fed daily, gas is used for cooking. The demand for gas-cookers is still maintained—these three Companies supplying not less than 700 to 800 a week; and if the other Companies in the immediate suburbs are included, the new cookers fixed in all London must average about 1000 a week. Substitute coal for this gas, and what would be the condition of London?

But this result has been obtained by slow degrees. The first introducers of gas-stoves were the late Mr. Sharp, of the Southampton Gas Company, I think in the forties, and (shortly afterwards) the late Mr. Goddard, of Ipswich, the father of the present Member of Parliament for that borough. Prior to 1850, in my father's house, the cooking was done by gas; and only by very slow degrees did it become general. For about thirty years, and in some places longer, the gas companies left the introduction of cooking-stoves to the makers and to the consumers, who had to purchase them outright, with the result that comparatively few came into use. It is to the system of letting on hire at a quarterly rental to ordinary consumers and to the supply of stoves with the slot meters that the present position is due. I am afraid I cannot say that the question of smoke abatement has had anything whatever to do with it. The gas companies simply desired to increase their business, and the consumers found it advantageous to use gas for cooking. The necessary facilities were given, and that is all. It will be no departure from truth to say that not a single gas cooking-stove has been fixed with the object of preventing smoke—in fact, that worthy object has never been considered by the parties, and, hey presto! it has, so far as cooking is concerned, been accomplished.

There remains a more difficult task for the advocates of smoke abatement, on which, if they are to succeed, they must concentrate their attention. The domestic fire used for heating is the problem. It needs extreme care, suitable appliances, and expert knowledge to burn bituminous coal in a steam-boiler or factory furnace generally, without smoke. It is vain to expect such a combination in the case of the domestic fire, though it may be improved. The main hope, therefore, lies either in smokeless solid fuel or gaseous fuel of some kind. The only solid smokeless fuels at present available are anthracite and coke. The former cannot be burnt in ordinary open domestic grates; and though the latter can be so burnt, it has not been extensively adopted, except in small houses, and not by any means generally. Coke, no doubt, is best when used in close stoves, and is at the same time very effective, and anthracite can only be so burnt. Abroad, close stoves are common; but England will have none of them for the heating of sitting-rooms.

We have been too long used to the cheerful open fire—which, in addition to its cheerfulness, serves another most useful purpose, as a ventilator—to give it up without good reason. Constructed as our houses usually are, we have to depend for ventilation on the chimney. I have had a number of experiments made in eight different rooms, which show that in ordinary dwelling-houses the chimney, when the fire is burning, will take away about five times the cubical contents of the room in an hour—in some cases slightly less, and in others considerably more; the range being from 7400 cubic feet an hour in a cottage bedroom (cubic contents about 1000 feet and a chimney 10 feet high) to 17,200 feet in that of an ordinary dwelling-house, in a sitting-room of 2104 cubic feet contents. In this case the chimney is 45 feet high above the fireplace. The lowest ratio in the eight experiments was five times, and the highest about ten times, a quantity of air equal to the cubical contents of the room in an hour—that is, where a fire, in some cases a gas-fire, was burning. In one room of the cottage where there was no fire, there was no measurable draught up the chimney. The air in a room with the window shut is not so fresh in the summer as in the winter, owing to the absence of the fire to create a draught up the chimney. The great importance of a good

draught up the chimney is therefore clear, and is a justification for the open fire against the closed stove. Gas-fires are often so placed as to partially block up the chimney, and thus check the flow of air, which is probably the reason why complaints are sometimes made against them. This, however, can be, and is, in many cases, avoided.

The chief objection to gas for heating is that it is more costly than coal when the fire is required throughout the day. Therefore the inhabitants of our towns will not adopt gas generally, even to please the Smoke Abatement Society. Give them as efficient heating, as convenient, and as cheap as the coal-fire, and they will in time—for the householder is very conservative—adopt gas generally. As to convenience and cleanliness in the house, gas has a great advantage over coal, which is one point in its favour. And for efficiency and ventilation, it can hold its ground; but its price is the crucial point. It is, however, used more extensively than is generally supposed.

The exact number of gas-fires in use can only be estimated, because in the majority of cases they are purchased by consumers. The South Metropolitan Company have 19,765 on hire; but this is no measure of the total. A canvass has been made in a number of streets, mostly of private houses, with the result that 38 per cent. of the ordinary consumers have gas-fires in their houses, with an average of two fires to each house.

The following is the list of the places canvassed:—

Place.	Number of Houses Canvassed.	Number of Gas-Fires.		Number of Incandescent Burners.		Number of Consumers using Cooking-Stoves.
		Consumers.	Fires.	Consumers.	Burners.	
Kennington Park Rd. . .	93	27	46	77	355	71
Narbonne Avenue, S.W. .	100	37	45	96	365	96
Burnt Ash Hill, S.E. . .	78	52	124	53	250	44
Stockwell Park Rd. . .	68	22	37	48	235	57
Camberwell Grove . . .	63	24	42	53	342	41
Wickham Rd., Brockley .	52	38	100	38	271	34
Louisville Rd., Tooting .	123	41	88	115	571	106
Norwood Rd.	98	39	71	83	420	78
New Cross Rd.	60	14	35	54	253	42
Wrottesley Rd., Plumstead	72	27	43	62	268	63
Maryon Rd., Woolwich .	83	25	42	74	457	76
Lee Rd.	74	30	94	48	189	36
Trinity St., Southwark .	33	3	3	28	133	17
	997	379	770	829	4,109	761
	—	38 p.c.	Average 2 to each.	83 p.c.	Average 5 to each.	76 p.c.

The great desideratum for smoke abatement is cheap gaseous fuel. Fortunately illuminating gas, thanks to the Welsbach mantle, is no longer necessary; heating power being the only requirement. To use gas with a luminous flame burner is now nothing less than unjustifiable extravagance. As shown in the above table, over 80 per cent. of the consumers have mantles; and in a short time it is hoped that it will be as difficult in England as it is in Germany to find a flat-flame burner in use.

This being the position, there is no real obstacle to the supply of one quality of gas for all purposes. Prior to the introduction of the mantle, it was held that, if fuel gas was wanted, it would have to be supplied in separate mains; and this would have been impracticable. There is not room in the roadways for another complete set of gas-mains of large capacity. Now, however, an 8-candle gas would answer all purposes. An entirely non-luminous gas would do, but there are passages and cellars and other out-of-the-way places where a small light is necessary; and this can be better obtained by an ordinary burner than by the use of a mantle.

There are, however, two difficulties in the way. In London the County Council have put every possible obstacle in the way of all the Gas Companies' efforts to obtain parliamentary sanction to reduce illuminating power; and in the meantime the production of cheap gas suitable for all purposes is delayed. This struggle began in 1900, and is still going on. A notable advance has recently been made in the shape of a just method of testing gas. For nearly forty years have the Companies been subjected to a system of testing that entailed enormous expense and constant worrying anxiety, with no advantage to the public. This great waste of the money of the consumers and ratepayers is due to the mistaken idea of the London County Council that every proposal of the Gas Companies must be at variance with the public interest. The Gas Companies have no monopoly now, but are subject to fierce competition. If they do not supply the article the consumers want, they lose business. The restrictions imposed by Parliament—when the Companies had an absolute monopoly, and gas was the only practicable artificial light (the choice being between ordinary tallow candles, or oil at from 5s. to 7s. a gallon)—are now not only useless, but mischievous, because they stand in the way of the production of cheap, gaseous fuel, which I believe to be the great desideratum for the prevention of smoke.

The second difficulty is that we have not yet found the gaseous fuel suitable for the purpose, which can only come by slow degrees. We want freedom to work in this direction. The just method of testing mentioned above, to come into force in the New Year, will give us a certain measure of freedom to start towards the goal of a cheap fuel gas.

It is by these means that, in my opinion, lies the best hope of success in the abolition of smoke. It can only come by providing the public with means to supply their needs for heat and light that will suit them better than those at present available. The domestic fire is the point to attack; and this will not be given up for sentimental reasons. No householder will give up his coal fire simply to prevent a smoky atmosphere; but if an efficient and cheap substitute can be found, then a gradual change will be made. Legislation to control the householder in this matter is futile; and I hope the Sanitary Institute and the Smoke Abatement Society will not follow the Socialists in the belief that everything can be done by Act of Parliament. As much freedom as possible is what we want if we are to progress; but put not trust in legislation, which means restriction. The boy who said that pins had saved many lives explained that it was by people *not* swallowing them, and in like manner Parliament does a great deal of good by *not* passing many of the Acts introduced every session; and as many of those now on the Statute Book are productive of harm, Parliament might be much worse employed than in repealing those that are unnecessary and mischievous.

DOMESTIC SMOKE ABATEMENT.

Following the address came several papers, the authors of each of which gave a *résumé*, instead of reading the papers entirely.

The first was by Dr. H. A. Des Vœux; and it consisted largely of the experiences of the author in his own house with

Gas Cookers and Fires.

The following are extracts from the paper:—

If you want your atmosphere absolutely cleared of smoke, you will have to give up the use of crude bituminous coal, and use some of its products, such as gas or electricity, or some smokeless fuel; and I believe that it is not you sanitarians who are going to lead the way, but a person much more useful and practical in serving the needs of mankind. I mean our friend who presides in the kitchen, our cook. It is she who has found out that a gas-kitchener is essential in a house; and it is she who has discovered its advantages while you have been looking on. But, unfortunately, smoke is still emitted from the kitchen chimney; for in all moderately large houses, it is necessary to have a hot-water system as well, and in most houses the old coal-range is lighted for this purpose. How, then, can the hot water be supplied? Eight years ago I installed a coke-boiler; and each year I am more satisfied with it. It has given a magnificent hot-water supply throughout the house, at a temperature of about 170° Fahr.; and the supply has been so plentiful that I have been enabled to put on three hot-water radiators into passages. The cost of this system is from 1s. 3d. to 2s. a week, depending mostly on the price of coke. With a gas-cooker and a coke-boiler, the difficulties of a hot-water system, and the warmth of the kitchen are surmounted. If this system were installed in all the houses in London, the greater part of the smoke from private residences would be prevented.

When we come to the sitting and bed rooms, our problem becomes easier. I myself have a gas log-fire in my consulting-room, an anthracite closed stove in my dining-room, an open coal fire (the Florence grate) in my morning-room, and gas-fires in my bed-rooms. With regard to gas-fires in sitting and bed rooms, the greatest objections to them of which I am aware are the reputed drying of the atmosphere; and the sentimental objections that they are not so pleasant to look upon, and that they cannot be poked! To take the last first. Verily such a trivial objection ought not to stand in the way of a great sanitary improvement; and I wonder how often each of you daily pokes his fire! The second objection is a greater one; for there is no pleasanter sensation than the sight of a bright-burning coal-fire when we enter a room cold and tired. But what about the same fire which the housemaid has allowed almost to go out, and buried the burning coals with 5 or 6 inches of fresh fuel? The first objection is a real one, if true. Personally I find that, if I burn a gas-fire in a room with no ventilation, a peculiar sensation of dryness is produced; but I have discovered that it is readily removed by opening the window an inch or two. This is therefore an advantage and not a drawback; and there is certainly less draught in a room with a gas-fire than a coal-fire.

The "Lancet," on Nov. 26, 1893, published a very interesting article on heating and cooking by gas; and at the end it unhesitatingly recommended gas for both purposes. It takes for granted that a gas-fire dries a room more than a coal-fire, and states that this can easily be removed by the use of a bowl of water. But the drying of the atmosphere was not proved by analysis; and it has since been denied by competent authorities. I think that it is a subject which gas companies might profitably take in hand. Whenever a complaint is made as to fumes, or dryness from a gas-fire, a competent analytical chemist ought to make a complete examination of the atmosphere of the room and the gases in the chimney; and I feel no doubt that we should

soon be at the bottom of this frequent cause of disparagement of gas-fires.

With regard to cost, I will only say that I think in my own house cooking by gas is slightly (10 per cent. or less) dearer than by coal; but, like salt, it is not the amount that is consumed that costs the money, but the amount we waste. I append some figures showing the enormous increase in the employment of gas-stoves during the last ten years—figures which prove that it is the small consumers and poorer people who are using them more and more. Messrs. Lyons, the well-known restaurateurs, spend £10,000 per annum on gas for cooking.

Other sources of heat are available for sitting-rooms; electric heaters, anthracite stoves open or closed, coke, and other smokeless fuels. Of these, electric heaters are becoming more and more used. They are ideal from the point of view of a sanitarian (except that they do not help in the ventilation of a room); and I wish them all success.

Finally, our first great fight must be to insist on smokeless cooking, and fortunately it is the easiest to obtain, because cook is already converted, and to get rid of the open coal-cooker we have only to substitute an easily-managed coke-boiler. Smokeless cooking will rid us of 600,000 dirty chimneys; and the effect will be so enormous that our proselytizing will no longer be required.

Increase of Gas-Cookers Bought or Hired from Gas Companies in Ten Years, 1895-1904.

Metropolis and Suburbs.

Penny-in-slot meters	365,000	
Ordinary meters	170,000	
Total		535,000

Twenty Provincial Towns.

Penny-in-slot meters	135,000	
Ordinary meters	180,000	
		315,000
Total increase in ten years: Metropolis and twenty Provincial Towns		850,000

These figures give merely the stoves bought or hired from gas companies. Most of the huge installations of cooking-ranges for clubs, restaurants, hospitals, &c., are not bought through gas companies.

Increase of Heating-Stoves Bought or Hired from Gas Companies in Ten Years, 1895-1904.

Metropolis and suburbs	120,000
Provincial towns	50,000
	170,000

It is probable that a much larger number of heating-stoves are bought from makers or ironmongers than from gas companies.

The author moved—

That this conference, recognizing the evil effects of coal smoke on the atmosphere of London, recommends the Councils of the Royal Sanitary Institute and the Coal Smoke Abatement Society to urge the London County Council to seek powers to enforce smokeless methods of cooking in all new houses.

The next paper was by Sir CHARLES COOKSON, K.C.M.G. It was entitled

Coke as a Domestic Fuel.

The author (whose paper was presented in his absence by Dr. J. D. Mortimer) narrated his experience of the use of coke as the only fuel in all the grates in his own house, excepting for roasting; and for this a gas-stove has been found necessary. The following are excerpts from the communication.

In all the grates no bituminous coal but only the coke sold by the Gaslight and Coke Company has been used for five years, and in no case is any special apparatus or grate required. The initial difficulty which I found in the use of this smokeless fuel was in lighting it; but I very easily overcame this by putting under the grate an iron pipe, connected with the gas-service of the house, and perforated by air-holes at the side, so that the gas when lit reaches the coke laid on the lower bars of the grate. The flow of gas is controlled by a bunsen burner, higher up in the pipe. I find that the gas takes about ten minutes to ignite the coke, and that the average consumption in this time is something less than 6 feet of gas. After this time the gas is turned off by the bunsen burner; and the fire is kept up for the rest of the day by coke alone.

At the present price of broken coke—viz., 12s. for 12 cwt.—its cost is nearly half that of household coal as supplied to middle-class houses, and is still cheaper in comparison with coal of an inferior quality which the poor are obliged to buy in small quantities. Besides this, there is none of the expense for wood or other kindling material, which may be roughly estimated at not less than 5d. or 6d. a week for every fire; for the consumption of 6 feet of gas per diem at the current price costs no more than ½d. per week. The grate thus provided can be immediately and without the least trouble lit at any moment day or night; and the gas-flame gives an immediate heat up to the moment that the coke is ignited.

As compared with the other smokeless fuel—anthracite—it may safely be claimed for coke that it is, and must be, far cheaper and radiates a much greater heat; and, compared with gas and electricity and special smoke-preventing apparatus, coke is much more economical and requires no alteration whatever in any grate now in use. To counterbalance these indisputable advantages, the objection has been raised to the use of coke that it gives out unhealthy fumes. I have no hesitation in saying that there is no foundation whatever for the complaint. Of course, where there is not sufficient draught through the fire imperfectly consumed gases are liable to escape into the room.

If this objection to the use of coke may be safely set aside, I am bound to admit that there is one which would, as things now stand, appear to be unanswerable. All, or nearly all, the coke at present in the market is a bye-product of gas-retorts, and its quantity therefore is naturally quite insufficient to meet such a demand as my scheme contemplates in London alone. The only remedy for this is to produce a "charred coal," which, after utilizing a part only of its valuable volatile bye-products, could still be sold at a lower price than that of bituminous coal. This may be done, and has been done in Germany and elsewhere.

Dr. MORTIMER, supplementing Sir Charles Cookson's paper, said that, speaking for himself, he could fully confirm all the author's statements. He had now used the method advocated for upwards of two years in the ordinary grates of a modern flat. A bar, perforated with holes, and giving forth blue flames, such as was commonly used for heating the fire-balls in a gas-stove, was connected to a gas-tap at the side of the fire-place by a tube, which was partly of metal, partly flexible. The latter was necessary, because the ashes resulting from the combustion of the coke fell into the gas-bar, which should occasionally be pulled out and cleared. In ten or fifteen minutes, the gas might be turned off, and so in a very short time there was not only a cheerful open fire, but a beautiful glowing one. Coke had the same advantages as anthracite in being smokeless, in giving out great heat, and, unlike gas-stoves and electric stoves, in providing efficient ventilation to a room. It was much easier to light than anthracite, and gave a more pleasant looking fire. In the latter respect it had a great advantage also over gas-stoves, and still more over all kinds of closed stoves, which were very cheerless. It was also cheap, and if this method be used could be re-kindled almost as quickly as a gas-fire without any trouble in re-laying with wood and paper, like an ordinary coal-fire. Indeed, it had all the advantages of ordinary coal, and none of its disadvantages. The ashes were clean, and the grates were clean. There was a notable absence of smuts and black dust and dirt in the room, far less work for the servants, and none for the sweep. It was, of course, an advantage to have the grates lined with fire-brick; and in renewing the fuel there must be no stirring from the top, but the ashes must be raked out from below. He had never found the least unpleasantness from fumes; but it need hardly be said that if the grate or chimney was faulty, and the draught insufficient, these might come into the room just as smoke would if coal were burnt under the same conditions. Coke as a fuel had hardly been alluded to by the Chairman; and he hoped that coke as fuel, combined with gas as an illuminant, would meet with more favourable consideration than it had done.

Emission from Gas-Fires of Noxious Gases into a Room a Myth.

The third paper was contributed by Professor J. B. COHEN, Ph.D., B.Sc. It dealt with the work of the Leeds Smoke Abatement Society. One paragraph in the paper read: As regards the domestic hearth, there is no doubt the evil of smoke might be met if more attention were paid to the use of gas-fires. I have made numerous experiments with gas-fires, both in regard to the products of combustion and heating effect. I have convinced myself that, with a proper chimney draught, the alleged emission of noxious gases into a room is a myth; and I never found any carbonic oxide even in flue gases. The heating effect of coal gas burnt at the rate of about 22 cubic feet per hour in the gas-fires I employed, is greater than that of 3 lbs. of coal per hour in an ordinary fire-grate; but the cost of the gas is almost double. One defect of gas-fires, apart from their cost, ought to be easily remedied. They produce very little ventilation in a room, unlike a coal fire-place; and a room is apt to get very close unless other means of ventilation are provided.

The Sulphur Diffused in the Atmosphere.

Dr. SAMUEL RIDEAL supplied the next paper, which bore the title of "The Acids of Smoke." From it we select the following portions.

In London, about 16 million tons of coal are used per annum directly for heating purposes, and the sulphur content of this coal may range from 1 to 2 per cent.; this giving an annual production of from half-a-million to a million tons of sulphuric acid, which is diffused in the air.

As to the amount of sulphur sent into the atmosphere as acid gases every day in London by the three chief combustibles, I have calculated it from Board of Trade returns of the average quantities used to be approximately as follows:—

	Coal.	Gas.	Mineral Oils.
Pounds of sulphur given daily in burning	981,792	893	743
Ratio to mineral oils as unity	1,321	1·2	1

The sulphur arising from the burning of coal is, therefore, 1100 times that given by the combustion of gas. Mineral oils yield arly the same quantity of sulphur as gas. The naphtha burnt about the streets and markets is either a distillate from coal tar or from petroleum. The latter may contain as much as 0·5 per cent. of sulphur (308 grains per gallon), and the former from 0·27 to 0·94 per cent. (166 to 579 grains per gallon). The refined product sold commonly as "paraffin oil" varies very much in sulphur contents, from 0·013 to 0·274 per cent. I have found London shop samples at 8d. per gallon to contain 0·021 per cent., and at 10d. 0·045 per cent. (12·9 and 27·7 grains of sulphur per gallon respectively). We may conclude that hydrocarbon oils, when used for heating, contribute about the same small quantity of sulphur as gas does.

On the subject of the tarnishing of bright metallic surfaces, I found by experiments in 1903 with silver-foil, tin-plate, picture wire, curtain chains, white metal, and electro spoons, that such articles were affected far more rapidly and deeply by the outside London atmosphere than by the air of rooms in which gas is burnt. This may be explained by the fact that sulphurous and sulphuric acids, the chief products of the combustion of gas, do not cause blackening on silver and many other metals, while sulphuretted hydrogen (which is removed from coal gas) at once occasions it. Cohen and Hefford found that solid particles of soot influenced the discoloration of silver, and that, when the air was filtered through cotton-wool, the effect was much reduced. They showed also that clarified flue gases from coal-fires blackened lead-paper, and inferred the presence of sulphuretted hydrogen.

In 1898, 35 million tons of coal were burnt per annum for domestic heating purposes out of 157 million tons of total consumption; and, consequently, there was no legislative control as to the smoke or acids produced from one-fifth of the total. Five years later (1903), the domestic consumption had fallen to 32 million tons, while the total consumption had risen to 167 millions, thus showing the modern tendency to replace domestic coal consumption by improved methods of heating.

The substitution of coke for coal is only a partial remedy for the nuisance occasioned by the evolution of sulphur acids, since, as at present conducted, the gas industry is not restricted in the sulphur content of the coke produced. The sulphur in coke varies enormously, and may equal or even exceed the amount in the original coal; and as in the combustion of coke no smoke is produced, the acid gases pass out unnoticed and undetected into the air. Very possibly, being thus free from black, sooty, and oily particles, the gases are more diffusible, quickly become dissipated into the greater volume of air, and when condensed by rain, or by contact with cold surfaces, are consequently more dilute and less harmful than the corresponding amount of acid produced from coal consumption. It seems worth while for gas engineers to turn their attention to this problem, as the elimination of the free sulphur from coke would considerably enhance the value of this commodity, and would remove the chief objection to its extended use. Within recent years, the question of the removal of sulphur clauses from Coal-Gas Acts has been keenly debated in Parliament, notwithstanding the fact that the total amount of sulphur in coal gas is diminished in the first place by the amount of sulphur retained in the coke, and in the second place by the universal and compulsory absorption of the sulphuretted hydrogen in the crude gas. The total amount of sulphur removed in this way from coal gas is enormous, and makes the residual sulphur in gas—amounting to about 40 grains per 100 cubic feet—quite insignificant in comparison with the amount evolved in burning coke or coal; so that the relaxation of the sulphur clauses, by reducing the cost of gas purification, and thus extending the use of gas for heating purposes, will produce the anomalous result of diminishing the sulphur content of the atmosphere.

From experiments in 1902, and later with Mr. Hehner on a more extended scale, given in evidence before a Board of Trade Committee, I found that burning coal gas in a room does not increase the sulphur content of the air at any time to that reached in foggy weather in the outside air, because the water produced in the burning of the gas is far more than sufficient to absorb the sulphur oxides; and this water condenses them on to the ceilings and other basic materials that are present, where they become permanently fixed. A good whitewash ceiling can thus act as an acid scrubber for many years in an ordinary gas-lit room without renewal. But gas-stoves used for heating should always have a chimney; and in that case, since 95 per cent. of the sulphur is removed from the gas by purification, the sulphur acids emitted into the air will be only a fraction of those emitted from an equivalent of burning coal.

Producer Gas for Cooking and Heating.

From the succeeding paper by Mr. A. S. E. Ackermann, B.Sc., Assoc.M.Inst.C.E., we take the following.

To combat the smoke fiend, my proposal is that producer gas should be distributed to houses for warming and cooking, and to factories for industrial purposes. Producer gas is made from the cheapest coal, and has a calorific value of about one-quarter that of ordinary illuminating gas, and can be produced, even on a small scale, of 3½d. per 1000 cubic feet. In other words, 1s. 2d. worth of producer gas is equivalent to 1000 cubic feet of ordinary gas costing 3s. The South Staffordshire Mond Gas Company have now some 14 miles of producer-gas mains laid; and though they started to deliver gas only six months ago, the output is already 12 million cubic feet per day from the generating station at Dudley Port. This gas, however, is all used for industrial purposes, so will not decrease domestic smoke. The Act of Parliament under which the Company was formed does not allow them to distribute gas "for use in private dwelling houses." The price charged for this gas varies from 2d. to 4d. per 1000 cubic feet, or (say) 1s. for the heat equivalent of 1000 cubic feet of ordinary gas, which in South Staffordshire costs 2s. 5d. per 1000 cubic feet.

Producer gas is suitable for practically all purposes for which ordinary gas can be used, except that it will not do for illuminating, as its flame is non-luminous and its calorific value is too low for it to be employed with a mantle. The only objection that has been raised against it is that it contains a large percentage of that very poisonous gas carbon monoxide. The usual quantity is about 20 per cent.; but it is easy to reduce this. The Act under which the South Staffordshire Company are working does not allow more than 14 per cent. (and the gas has to have "a distinct readily perceptible smell"), while ordinary illuminating gas, which is often enriched with water gas, sometimes contains 12 per cent. of carbon monoxide; so that the difference on this point is very small, and, after all, does it matter very much whether a person is poisoned (say) in half-an-hour by ordinary gas or in fifteen minutes by producer gas?

When I first suggested the distribution of producer gas for the purposes named some three years ago, I was not aware that it had been used for cooking and warming, though, of course, natural gas (which has a much higher calorific value) has been so distributed and used in America for years with signal success. On making inquiries, it turned out that the Gloucester County Asylum has used producer gas for cooking during the last twenty-two years; while it has been used at the Walthamstow Isolation Hospital for the last five years. In the latter case, it is used for driving the gas-engines which generate electricity for lighting; and it is distributed for warming the blocks of buildings, for the hot-water supply, and for cooking. The kitchen is about 20 feet square and well ventilated. The whole of the cooking is done by producer gas. When I visited the plant in December, 1903, it was cooking for 80 persons all told; but the cook informed me that she could easily cook for 200 people with the same plant. The cooking apparatus is arranged against two of the walls; and over it are two wrought-iron hoods, which stand out 4 ft. 6 in. from the walls, and are placed 6 feet above floor-level. One of these was provided with an electric fan for drawing off the fumes; but very often they did not find it necessary to use this. There was just a slight smell of burning sulphur on entering the kitchen; and but for this it would have been impossible to tell that anything but ordinary gas was in use. The whole of the plant had, when I inspected it, been in operation for two years and eight months. There had been no renewals; and they had had no trouble whatever—no headaches, and no accidents. The stoves, &c., appeared exactly the same as any ordinary gas-stoves, except that the jets were slightly larger. Producer gas is also used for cooking at the works of Ashmore, Benson, Pease, and Co., Ltd., of Stockton-on-Tees, Brunner, Mond, and Co., Ltd., of Winnington, and the Co-operative Society, of Irlam.

One very important point, as it would greatly reduce the cost of introducing producer-gas warming, is that the existing open-fire grates could be used without alteration, simply by the addition of a multiple bunsen burner and hollow asbestos balls such as are used in gas-stoves using ordinary gas. This would not be the most economical way of using the gas, but would probably be sufficiently so in the case of most existing grates, while new houses could be fitted with efficient gas-stoves. Unfortunately, there are numbers of gas-stoves on the market which are poorly designed, and far from efficient, and which, when fixed, either have no chimney at all, or a very unsatisfactory one. It is such stoves and statements which gave gas a bad name for warming some years ago, and has done much harm by retarding its use, though it must be admitted that with gas at 3s. per 1000 feet, the cost is too much where constant fires are wanted.

It has been objected that, by the system here advocated, the volume of gas would be so great that the distributing mains would have to be excessively large. Fortunately gas is compressible. The pressure at which ordinary gas is distributed is equal to about 3 inches of water, which is equivalent to 0·108 lb. per square inch (above atmospheric pressure); while in America they distribute gas at a pressure of 20 lbs. and even 80 lbs. per square inch (above atmospheric pressure). Now the volume of a gas is inversely proportional to its absolute pressure; and from this it will be seen that in increasing the pressure from 0·108 lb. per square inch to 20 lbs. per square inch (both by gauge) the volume is reduced to one-half, and if the final pressure be 80 lbs. per square inch, then the final volume is less than one-sixth that of the initial.

Gas from the Pit's Mouth.

The last paper was by Mr. Arthur J. Martin, Assoc.M.Inst.C.E., on "Smoke Prevention and Coal Conservation." It was of considerable length; and the following is a summary of the salient parts.

As an instance of what can be accomplished by checking the use of bituminous coal, the author cites the case of Pittsburg,

Pa., the atmosphere of which was transformed by the introduction of natural gas. A similar change would be effected if gas were generally used in place of coal for cooking and heating, and for power purposes; but the price of gas stands in the way. A number of cheap gases have been introduced for use as fuel, as, for instance, Mond gas and Dowson gas. But their adoption in London would add one more to the many systems of pipes with which the streets are already honeycombed; and it is not certain coal gas cannot be made to meet all requirements.

At 1s. or 1s. 6d. per 1000 cubic feet, it is estimated that gas would compete successfully with coal; and a price of 2s. would greatly stimulate its adoption for heating and power purposes. In Widnes at the present time, ordinary coal gas is actually sold at 1s. per 1000 cubic feet; and it has been produced at as low a cost as 1d. In the latter case, the gas was a bye-product from the manufacture of other commodities in a big chemical works. According to the published accounts of the largest London Gas Company, the cost of the coal represents nearly two-thirds of that of manufacturing the gas; and of this probably no less than half, or (say) 8d. per 1000 cubic feet of gas, is accounted for by the expense of bringing the coal from the collieries. Here, then, is room for a substantial reduction in the cost of gas.

The method which the author proposes for bringing this about is by generating the gas at the pit's mouth, and conveying it to London in steel pipes at high pressure. He shows that a single line of 6-feet pipe will bring from the Yorkshire coal-fields a supply of gas equal in heating power to the whole of the coal burnt in the Metropolis; thus taking the place of the 550 coal trains, and the thousands of horses and carts required for the conveyance and distribution of the coal. The present cost of these services to the consumer is probably something like £9,000,000 per annum. This sum would pay for laying down four lines of pipe equal in carrying power to the single line of 6-feet pipe; and another £10,000,000 would pay for the engines and machinery required for compressing the gas. Interest, depreciation, and working expenses would amount to £2,370,000, or about one-quarter of what it costs to carry and distribute an equivalent amount of coal. A further important saving would be effected by the utilization in the gas-retorts of the dust and small coal, which will not bear the cost of railway carriage, and of which some 24 million tons or more are thrown away at the collieries every year. The superior facilities for manufacture obtainable with the most modern plant, erected on ample sites, should permit of further important reductions. It seems reasonable to assume that gas may be delivered into the holders in London at from 8d. to 10d. per 1000 feet, as against 1s. 3½d. at present. To this must be added the cost of distribution, management, &c.

In conclusion, the author proposed—

That in view of (1) the need for husbanding our coal resources, (2) the deplorable and increasing evils produced by smoke fogs, and (3) the necessity for providing fuels for domestic and industrial uses, the Councils of the Sanitary Institute and the Smoke Abatement Society be asked to join in a memorial to His Majesty's Government, setting forth the urgency of this question.

Discussion.

There was not a great deal in the discussion on the papers that is of special interest to readers of the "JOURNAL;" and the merest indication of some of the points will therefore suffice.

Mr. AITKEN BERRY seconded the resolution proposed by Dr. Des Vœux. He said that a few years ago, he was strongly opposed to the use of gas for both heating and cooking; but it was the prejudice of ignorance. Perhaps in a measure, too, it was caused by the miserable arrangements which they then had for utilizing gas for these purposes. Since that time (within the last ten years), he had not the slightest hesitation in saying, from personal experience, that gas both for heating and cooking could be used in any household with the greatest advantage.

Mr. BEALE COLLINS seconded Mr. Martin's resolution; and Mr. T. C. HORSFALL made a few remarks.

Dr. ORMANDY spoke of the difficulties of making arrangements in small houses for the adoption of smoke-preventing appliances, and urged that the Councils of the Sanitary Institute and of the Smoke Abatement Society should get into touch with the builders and architectural societies on the subject. He saw one difficulty in the replacing of coal by gas—that there would be an enormous amount of coke produced, for which an outlet would have to be found.

Mr. T. G. MARSH showed that he was no great believer in legislation in diminishing the smoke nuisance; and that he was of opinion that it was by such missionary enterprise as they were engaged upon that day, that manufacturers would be shown the considerable advantage of doing away with the use of fuel in the solid state. In the Manchester district, he had had the pleasure of seeing several engines of 1000-horse power for electrical work driven by gas, and was informed that the users were thoroughly satisfied with them. He had also seen, in the immediate neighbourhood, very many gas-engines of 400 and 500 horse power. These engines were worked with producer gas. He had been in factories where in times past the smoke went away in great volumes; to-day they saw practically no smoke from them. It had not been from any æsthetic motives that these factories had put these gas-engines in; it had simply been a matter of £ *s. d.* If the Smoke Abatement Society would use figures that were easily ascertainable as to the great economy of gas-engines as against steam-engines, then he had no doubt they would shortly be rid of their big factory chimneys altogether. With regard to the use of gas for domestic purposes, he believed the difficulties would be overcome when gas companies were given the freedom which they ought to have. Restrictions were put upon them in the days when they had a monopoly. Things, however, had changed. They wanted no legislative interference now; but they asked to be allowed to sell gas at any price they liked for any purpose. Gas ought to be sold at a much less price for some purposes than for others. But the Legislature said: "You cannot do this; and you must not do this." He objected to the Legislature interfering in any shape or form with matters that they did not understand.

Mr. Councillor MUIRHEAD (Liverpool) regretted that electricity had not been referred to. He thought there was a great deal to be said in favour of it for warming, though he admitted it did not give very great heat. He had in use an electric radiator that was most effective. He agreed that, at the present time, they were going in too much for legislation; while the best way to promote those interests that they had at heart was to attack the people gradually, and let them know the rights and wrongs of these matters. Then success was only a matter of time. He considered that gas undertakings should be bought up by municipalities, as he believed gas had a great future before it.

Mr. B. H. THWAITE expressed the opinion that bye-product coke was the best solution of the problem that had been put before them that day—that was to say, coke not denuded of all its hydrocarbons. If Parliament would permit gas undertakings to reduce the illuminating power to 8 or 10 candles, it would be a great advantage to gas consumers, and would enable gas to be used far more for heating purposes.

Mr. E. A. DOWSON expressed the opinion that coal gas was better for general distribution than producer and water gas. He also held that, in designing stoves for producer gas, provision should be made, by means of a hood, for all unburnt gas to be taken up the chimney without any discharge into the apartment. It was always wise, too, with both producer and coal gas, to have a pilot light burning in gas-stoves.

Mr. THOMAS POTTERTON, referring to the question of hot water for small dwellings, said with a slot-meter, for 27 cubic feet of gas, he could get a first bath at 95° starting the water from 40°. For a second bath, with 27 cubic feet of gas, he could get 20 gallons of water at 105°.

Mr. MARKEL and Mr. MACAULAY also spoke, the latter gentleman saying that he saw an objection to the combination of bunsen burners with coke-fires, in the stopping up of the burners.

The CHAIRMAN, in putting Dr. Des Vœux's motion, remarked that he should support it for one very good reason. It was commonly said that it was the last straw that broke the camel's back. The London County Council were already far too over-burdened; and if the resolution was adopted, and succeeded in breaking the Council's back, he for one should not be sorry. (Laughter.)

On being put to the vote, the Chairman declared the resolution not carried; but it was understood that the one proposed by Mr. Martin was passed.

Very cordially, the authors of the papers were thanked; and the Chairman's services were also heartily acknowledged.

This concluded the first day's sitting. Thursday morning was devoted to the consideration of papers specially directed to "Factory and Trade Smoke Abatement;" and Friday morning to communications on the subject of "Administration, Legislation, and Necessary Reforms."

Visits to Works—At the Old Kent Road Works of the South Metropolitan Gas Company.

On Wednesday afternoon, the delegates visited the Chelsea generating-station of the Underground Electric Railways Company of London, on Thursday the Old Kent Road works of the South Metropolitan Gas Company, and on Friday the Abbey Mills pumping-station of the London Sewage Outfall Works.

Regarding the visit to the Old Kent Road works of the South Metropolitan Gas Company, there were probably some thirty to forty delegates who braved the half-hour's ride in electric trams to the heart of what, on a dull December afternoon, is not a particularly inviting part of South London. But inside, the Old Kent Road works—gas manufacturing works though they be—the visitors found they presented a more cheerful aspect at this time of the year than many a street through which they had had to pass to get to them. It was in the entrance hall to the offices that the visitors assembled—receiving individually from Mr. Charles Carpenter, the Chief Engineer, a most courteous welcome. He accompanied the visitors round the works; but Mr. Gibson, the Manager of the station, and the assistants heartily fulfilled the duties of guides. The great holders, including the one that ranked as Sir George Livesey's masterpiece in holder construction before the 12 million cubic feet one was built at East Greenwich, attracted the attention of the visitors, for their height told of preparedness in meeting whatever might come in the way of fog, and an interested willingness to do a not unimportant share in relieving London from some of the worst part of the discomfort and terrors of such a visitation. Past the holders, the party went to one of the retort-houses, where they

were highly pleased in seeing the "Co-Partner" pusher at work and the West compressed-air charging-machines. By the way, it was gathered from Mr. Carpenter that there are eight of these pusher-machines now engaged in the operations at Old Kent Road; and they work so smoothly that the wonder is why the day was so long coming when machines of the kind were a reality in the operations of gas-works. But they are so now. The wear and tear is almost inappreciable; the packing appearing to be the only thing that requires occasional attention. Even this is being reduced to a minimum, as the latest type of the machine at Vauxhall is showing. Descent was made into the basement of the house to see the method of quenching the coke, and its removal by a train of trolley waggons and wire ropes. In the view of Mr. Carpenter, this is a system that would be hard to beat. The outside producers for heating the retort-benches were the objects of much curiosity, and consequently of explanation. That such great manufacturing operations could be carried on withoutladening the surrounding air with smoke, of course, met with the approbation of the visitors. Four of the houses are now equipped with these producers; and next year will see them applied to the last house. The air-compressor house was then inspected; the exhauster-house, condensers, and so on following the ordinary course of the operations.

An outline description of the works was distributed among the visitors; and we reproduce it—

These works are composed of two sections—the old works and the new works, having a combined area of about 33 acres.

All the coal used for gas making is sea-borne Durham gas coal, brought by colliers to the Surrey Commercial Docks, and from thence lightered to the gas-works, *viâ* the Grand Surrey Canal. The coal is lifted from the barges by steam-cranes fitted with Hone's crabs to an elevated gantry, from whence it is run into the coal-store by means of trucks, shot on to the coal-breaker, and then elevated to the high-level coal-hoppers supplying the retort-charging machines.

The modern retort-houses, Nos. 7, 8, 9, and 10, are each 150 feet long by 71 feet wide, arranged side by side at right angles to the canal, while beside each is a coal-store holding about 1750 tons of coal. Each retort-house contains sixteen settings of elliptical retorts, ten in a setting, and produces 2½ million cubic feet of gas per twenty-four hours.

Producer-gas firing is adopted for heating the retorts; it being found that this is most economical, as well as smokeless, since complete combustion is obtained, owing to the perfect control of the gas and air. The producer-gas is generated in outside producers, two to each house, and contains about 28 per cent. of carbon monoxide, 2½ per cent. of carbon dioxide, and 8 per cent. of hydrogen, which gives a waste gas in the shafts containing about 19 per cent. of carbon dioxide and 1 per cent. of oxygen.

The retorts are charged by West's compressed-air charging-machines, and the coke is ejected therefrom by hydraulic pushers. The coke falls into hoppers under the stage, where it is quenched; and, after draining, is allowed to fall into trucks, and drawn out of the retort-house by endless wire ropes (driven by gas-engines), being finally tipped on to the coke-heap.

The hot coal gas is drawn from the retort-house, through vacuum governors, by four exhausters driven by two "Farey" compound condensing engines. It is then condensed in four sets of reversible water-cooled condensers, each of which consists of twelve 24-inch vertical pipes having sixteen 2-inch water-tubes in each. To obtain the greatest efficiency, the gas travels in the opposite direction to the water. Having been thoroughly cooled, it passes to the Livesey washers, which are worked in two sets of threes. From here it passes through the scrubbers, where the final purification for ammonia takes place.

The gas is then passed through purifiers, charged with hydrated oxide of iron; and the whole of the sulphuretted hydrogen is thereby removed. The purifiers are worked in sets of six; each purifier being a box about 40 ft. by 30 ft. by 5 ft. deep. From the last purifier, the gas passes to the station meters, the drums of which work in concrete tanks sunk in the ground, and so save the expense of a meter-house. From the meters, it enters the storage holders.

The gas made at these works is not sufficient to supply this part of the Company's district; and therefore additional gas is pumped here from the East Greenwich works through about 4 miles of 48-inch main by means of centrifugal fans. Other fans are employed to supplement the pressure given by the holders during the periods of maximum demand.

The Old Kent Road works are provided with workshops for cleaning and repairing gas-cookers, gas-fires, meters, lamps, and gas-fittings, while large quantities of cast-iron main pipes are also stored.

Exhibition of Cooking and Heating Appliances.

Although limited by the accommodation that could be afforded, the exhibition of inventions which have as one effect in use the prevention or diminution of smoke in connection with heating in the domestic and industrial services was good, and merited the attention bestowed upon the stands. Naturally gas appliances were the most prominent, though electricity, in a small way, endeavoured to assert its usefulness in domestic heating and cooking. In considerable variety were the stoves and appliances of greater character and claim for coal, anthracite, and other fuels—smoke-consuming and fuel economizing—for dwelling-houses and factories. Among the firms in this latter section were Messrs. Babcock and Wilcox, Limited, and Messrs. Meldrum Bros.—the latter illustrating, among much else of interest, their refuse destructors and forced-draught furnaces. Ventilating appliances were also on view. Mr. J. W. Lovibond exhibited charts, together with several forms of instruments for measuring (among other things) colour, smoke, and soluble gases from burnt fuel. The "'Ados' Automatic CO_2 Recorder" was on show by Messrs. Sanders, Rehders, and Co. The Power Gas Corporation had on view some models of Mond gas plant. The South Metropolitan Gas Company instructed visitors in the subject of gas testing, by showing in use the photometer for measuring incandescent and other high-power burners, as exhibited to the International Photometrical Commission at Zurich in 1900. Messrs. Crossley Bros. claimed attention with a beautiful specimen of a 12-horse power engine on town gas, or 8½-horse power on producer gas, together with a suction-gas plant suitable for 12 to 24 horse power. Sir Charles Cookson, illustrated his paper with an open stove burning gas coke and lighted by perforated iron pipe, with bunsen burner, and connected with a gas-service, as well as one burning charred coal as produced by the coke-ovens of the Otto Hilgenstock Coke-Oven Company.

The assortment of exhibits displayed by the makers of gas stoves and appliances, was appropriate to the objects of the conference. Mentioning the firms in the order in which their stands were numbered. they were: Messrs. Parkinson and W. & B. Cowan, the Imperial Stove Company, the London Warming and Ventilating Company, the Cannon Iron Foundries, Limited, Messrs. William Sugg and Co., Messrs. Fletcher, Russell, and Co., Mr. William Edgar, Mr. Joseph Nutting, Mr. Thos. Potterton, Davis Gas-Stove Company, Messrs. Wilsons and Mathiesons, and Messrs. John Wright and Co. All the firms had a variety of goods including arrangements for hot-water heating.

We have omitted from the foregoing list the Richmond Gas Stove and Meter Company, Limited, for the simple reason that at this exhibition they successfully endeavoured to get away from the stereotyped plan of displaying their goods. It was an excellent attempt—well conceived and equally well executed. Their space, some 29 ft. by 22 ft., was partitioned to represent a flat—the rooms, from the entrance-hall onwards, being furnished in suitable style by Messrs. Shoolbred and Co.; and every room was fitted up with some sample of the Richmond Company's cooking and heating arrangements (including the "Neptune" gas-heated circulating-boiler, which is described on another page). The fire fixed in the dining-room was a new design of copper panel fire, of handsome and artistic appearance. It embraces the various later improvements of the firm, including the automatic air-regulator.

In lighting, Messrs. William Sugg and Co., Limited, Mr. William Edgar, and Messrs. A. E. Podmore and Co., were showing specimens of their several well-known lamps for incandescent purposes.

The Gaslight and Coke Company made an effective exhibit with their model smokeless kitchen, in which lectures and demonstrations were given each afternoon and evening.

"Consultations Free."

As a variant of the "Advice Gratis" applications from which gas engineers (as well as other professional men, probably) are subject, an attempt to get served "on the cheap" was communicated last week. It is to be hoped that all who were "favoured" with a letter in the terms given below refused to deal with the application unless professionally engaged. The letter was written to the Engineer of a gas-works in the neighbourhood—not by a brother gas manager, but by the Clerk to the Llandrindod Wells Urban District Council.

Dec. 11, 1905.

Dear Sir,—It is proposed to erect a gas-works in this town; but some danger is apprehended from the effluent from the works, which must eventually, in some state, get into a small brook which runs near and empties 300 yards away into a river, on which, three-quarters of a mile lower down, is the pumping-station, whence the town's water supply is pumped. Of course, the gas-works will be a small affair for a time, and the site is 2 acres in extent; so that filtration would seem possible. But I would be much obliged if you would favour me with your views on the subject, particularly whether the effluent could be so treated as to become inoffensive by the time it reached the river. I have to thank you in anticipation of your kind reply.—Yours, &c.,

(Signed) D. C. Davis, Clerk.

The Transactions of the Societe Technique.—We have received the volume of proceedings of the Société Technique du Gaz en France for the present year. It contains the report of the thirty-second annual congress, held at Havre from the 20th to the 23rd of June, with the papers submitted by the members, and notes of the remarks to which they gave rise. Most of the papers have already been dealt with in the "Journal." They are illustrated by diagrams and seven plates. The other matter consists, as usual, of particulars in regard to the Society's prizes, the rules, accounts, lists of officers and members, &c. M. Victor Delahaye reviews the legal business of the year 1903-4, and brings up to date his index to the cases contained in preceding volumes back to 1884. This constitutes a useful supplement to the technical matter. The Havre congress will always stand out prominently in the history of the Society for the cordial reception given to the members by the European Gas Company; and in the portion of the volume devoted to the social functions of the meeting their hospitality is duly recorded. It only remains to say that the volume has been produced under the supervision of M. Payet, the Secretary of the Society.

DEVELOPMENTS IN "OMEGA" GAS-HEATERS.

While the advantages of gaseous fuel, from the point of view of cleanliness and readiness of application, are now generally acknowledged, there are still to be found persons who complain that its use is attended by an unpleasant odour. In most cases the origin of the complaint is to be found in the ventilating arrangements of the apartment in which the stove is being used, and not in the appliance itself. There are, however, upon the market stoves which can be used without giving rise to the objection referred to, and among them is the "Omega," made by the Odourless Gas-Stove Company, Limited, of Bristol. It is claimed that the result of their use is "to secure perfect combustion by the generation of intense heat and the thorough progressive mixture of the gas and air, and that by this superheating and admixture the discharge of noxious vapours is entirely obviated. Moreover, as the air in the room is rapidly drawn through the heater, it is purified and kept at a normal degree of humidity—the effect being a perfectly pure moist atmosphere at a regular temperature." It follows from what has been said that, where ordinary laws governing proper ventilation have been observed, the "Omega" gas-stove may be used without a flue; and the Company contend—and, indeed, are prepared to guarantee—that this can be done. Consequently, the stove can be easily installed and moved from room to room.

The foregoing indication of the main features of the stove may be supplemented by a few particulars in regard to some recent developments. In the first of the accompanying illustrations is shown the Company's new rectangular stove, which is constructed with a much larger heating surface for the gas consumed than was possible with the earliest patterns, whereby the volume of hot air is proportionately increased. The complete apparatus consists of modifications of the original designs, inasmuch as the outer case is fitted with two or three distinct heating sections, each having its own gas controller, so that one or more may be put in or out of action as needed. This apparatus, with its three sections, delivers upwards of 8000 cubic feet of hot air per hour, which leaves the heater at a temperature of about 700° Fahr., with a gas consumption of 39 cubic feet at 1¾ inches pressure. This design is also made in a smaller size, of two sections only; and another is now in construction on the same system for a single section. These heaters are suited for churches, schools, public halls, corridors, railway waiting-rooms, &c. The second illustration represents the Company's hot-air system applied in the form of a table, specially constructed for restaurants, saloon bars, &c. The table-top ring is insulated from the heating chamber, so that the temperature of the table itself is but slightly affected. The quantity of hot air delivered from this heater for every 17 cubic feet of gas used is stated to be something like 3000 cubic feet per hour.

In addition to the stoves just noticed, the Company have put upon the market a very simple little "window drier," for the prevention of steamy windows, which is also constructed on the "Omega" principle. It is claimed for this drier that it will not ignite linen or paper when brought into contact with it.

"NEPTUNE" GAS-HEATED CIRCULATING-BOILER

One of the newest of the many interesting exhibits at the Smoke Abatement Exhibition last week was a complete set of appliances, illustrating the fitting up and uses of the "Neptune" gas-heated circulating-boiler. This was at the stand of the Richmond Gas Stove and Meter Company, Limited. It has been a common complaint that one of the drawbacks to the full adoption of gas heating in households is that the domestic requirement of a constant hot-water supply is not obtainable as in the case of the ordinary fire grate; but this complaint has been (so far as late years are concerned) the issue of ignorance. During the Smoke Abatement Conference, there appeared to be, among the readers of papers and speakers, some amount of misconception on the point; but the testimony of others, together with what was seen at the stands of the various makers of gas appliances, should have effect in dispelling the misconception, and promulgating the information that gas undertakings are prepared to supply the necessary fittings for hot-water supply as well as gas ranges or fires.

The new system of water heating which the Richmond Gas Stove and Meter Company have taken in hand is one for attachment to the existing hot-water circulating-pipes connected up with the ordinary domestic coal-range boiler, which circulating system is already fed by a cistern supplied from the town's mains. Therefore there is in the fitting up of the new boiler (the heating medium for which is, of course, gas) the minimum of interference with the house in which it is installed. Briefly described, the invention consists of a boiler made of a series of discs and chambers through which the water flows, and heated in its progress from its inlet to the discharge outlet into the existing return-pipe. A further advantage consists in the fact that the boiler, being made of strong cast iron, will stand a head of water equal to the strongest coal-range boiler. Before leaving the works the boilers are tested to a 60 feet head of water. A door opens in front, which admits of cleaning the various water chambers from lime deposit, sediment, &c. For safety in lighting, cleaning, &c., the gas-burner is adjusted to swing out clear of the boiler base stand, and is a duplex ring with separate taps, so that one or both rings may be used as required. The smaller ring (burning only 8 cubic feet per hour at 1-inch pressure) will, generally, be found ample for ordinary domestic requirements, as also for maintaining hot storage at night. The flanges at the top and bottom, for the flow and return connections, are screwed for ¾-inch iron pipe. To guard against any danger from frosty weather, negligence, &c., a safety-valve set at 20 lbs. pressure (equal to 40-feet head of water) is provided.

The "Neptune" boiler should relieve many gas managers faced with the difficulty of expeditiously, and with little inconvenience, giving a circulating hot-water supply in dwelling-houses and other establishments where it is required to displace coal by gas.

The Introduction of the Telescopic Gasholder.

In the paragraph headed "Another Link with the Past of the Gas Industry" which appeared in the "JOURNAL" last week, it was stated that the system of cupping for gasholders was introduced, as the result of a suggestion by Mr. Geddie Pearse, at the Ratcliff Gas-Works, soon after Mr. Magnus Ohren re-entered his service in 1850; and that Mr. Ohren consequently saw the first "telescope gasholder." A correspondent who has had a fairly long connection with the gas industry—though not so long as Mr. Ohren's—points out that telescopic holders were common long before the year named; the South Metropolitan Gas Company having erected one in the middle of the thirties, and a second in 1840. Our correspondent says he well remembers its construction. He thinks the origin of these holders must be sought in the thirties, or more likely in the twenties—perhaps even before this, as the water-lute was among the earliest of gas inventions. It would be interesting to have some information as to the first use of telescopic holders; and therefore we shall be pleased if any of our readers can furnish particulars in regard thereto.

An Association of Victorian Gas Engineers.

At a convention of the Gas Managers of Victoria, which was held on the 28th ult., it was decided that an Association of Victorian Gas Engineers should be formed, with a view to furthering the interests of the profession and exchanging views on its latest developments. Mr. R. O. Thompson was elected President; Mr. Swinburne, Vice-President; and Mr. P. C. Holmes Hunt, Hon. Secretary. Mr. Thompson, who occupied the chair at the convention (at which there was a large and representative gathering), delivered an introductory address on the progress of gas in Victoria. The foundation-stone of the first gas-works in the State was laid at West Melbourne in 1854, by the Mayor of Melbourne (Mr. J. T. Smith). Other Gas Companies were subsequently formed; and in 1878 the three undertakings supplying gas were amalgamated, under the name of the Metropolitan Gas Company. Lunch was served at the Savoy Hotel; and in the afternoon the members of the convention visited the gas-works at South Melbourne, where they inspected the whole of the plant and machinery. Afterwards the visitors were entertained at tea by the Gas Company.

HIGH-PRESSURE GAS ILLUMINATION.

An excellent coaching on the subject of "High-Pressure Gas Illumination" was given to the members of the Association of Engineers-in-Charge last Wednesday by Mr. J. W. Blakey, who read before a large meeting a paper accompanied by lantern slides and practical demonstrations. A great deal of trouble was taken by the author to describe the various systems in use—the Selas, the Somzee-Greyson, the Millennium, the Pharos, the Sale-Onslow, the Keith-Blackman, the Sugg, that of the Air Light Company, and the Colonia. He also alluded to the Lucas and Welsbach intensified systems, and the Scott-Snell lamp. The Colonia is a new introduction, which, however, Mr. Blakey said "does not seem to have any features which are not covered by the earlier systems—the Pharos and the Sale-Onslow." He had been informed that it fulfilled all that was claimed for it; and he could quite imagine it would be as efficient as "its own brothers." Reference was also made to the Omnia high-standard gas-lamp, which was described in the "JOURNAL" a few weeks ago.

Mr. Blakey said a good deal of attention was at the present moment being devoted by gas engineers to the production of a cheap little machine suitable for the small tradesman who only needed a few brilliant lights. The conditions were difficult, for the compressor must be automatic in its action, must be inexpensive, and must not be driven either by an electric or gas motor. Compressing gas or air from the ordinary water supply was the direction which most of the inventions were taking. Mr. F. A. Snell had invented a water-driven pump, which only weighed a few pounds, and the cost of which was quite nominal. It was designed to hang on a wall-bracket; and it compressed air in a drum, from which it passed through a small independent pipe to each burner—the pressure being regulated to suit the character of the burner and the mantles. In another arrangement—that of Mr. Klamar—water pressure was used to drive a slow-running pump, compressing the gas in a bellows. The special features of this plant were its steadiness of supply at any fixed pressure (this being secured by means of a new and ingenious control-valve), and its automatic action. It seemed, however, somewhat too expensive for the purposes of very small lighting; and the pump was a trifle complicated. So far as he was aware, the author remarked, the only man who had left what were becoming stereotyped lines was a young Swiss engineer, living in London. His compressor was of the bicycle-pump type, designed in the cheapest possible way; the chief point of it being a clockwork mechanism to supply the power. The only attention needed on the part of the small consumer was the daily winding of the clock; and there was nothing that could get out of order.

Mr. Blakey concluded by quoting some figures to demonstrate the comparative cost of high-pressure lighting and various other systems of illumination. He said the superiority of high-pressure lighting in this respect was best shown by taking a common standard of 1000-candle power for one hour, and adopting the actual average prices (according to the last published returns) for gas and electricity for lighting purposes in London and the suburbs—gas 2s. 8·061d. per 1000 cubic feet, and electricity 4·096d. per Board of Trade unit. Taking high-pressure gas lighting at 1·00, the comparative costs of various electric systems was: Bremer light, 1·85; arc lamp, 2·78; Nernst lamp, 4·49; and incandescent electric lamp, 12·77. The cost of mantles was included, but not that of carbons for arc lamps, so that anyway his figures were on the right side.

After an interesting series of views of recent high-pressure gas installations, and the various forms of plant used for the purpose, had been shown on the screen, and the members had carefully inspected the apparatus which was on view in the building, some discussion took place on the paper. But before this, a hearty vote of thanks was accorded to the author, on the proposition of the President of the Association (Mr. J. Patten Barber), who occupied the chair in the absence, through indisposition, of Mr. F. W. Goodenough, who had promised to preside. The first speaker was an electrical engineer—Dr. Baker—who, referring to the Millennium plant, said he had noticed it acted in a very excellent manner with regard to keeping the pressure constant; while he had reason to believe that the broken mantles were a negligible quantity. As to the applicability of high-pressure gas lighting, enormous strides were being made by it. In Germany, for instance, it was being largely preferred to electric arc lighting, from an economical point of view, in spite of the fact that the electric plants were very well equipped and efficiently worked. Electricity would have to make great headway before it could get in front of high-pressure gas for outside lighting. Mr. H. Dodimead said that, as the Chief Lamp Inspector of the Gaslight and Coke Company, he held no brief for any particular high-pressure lighting system. Twelve months last October, they laid down a Millennium plant for lighting Aldwych; and since then the system had been extended into Kingsway. These streets were illuminated by high columns giving a great intensity of light. There were, however, others that might not be so powerfully lighted, though to his mind as efficiently. One installation of which he was very proud was that recently carried out in front of Buckingham Palace. It was put down by Messrs. Sugg and Co., and was greatly admired by those who had seen it. He had every confidence in saying that high-pressure lighting had come to stay.

After this, the President said that he would like to make a few remarks with respect to the application of high-pressure gas to street lighting. Of course, the thing to be aimed at in street lighting was not, as some people imagined, to illuminate the higher storeys of the buildings. The object, he took it, was to light the street—to get a light of sufficient intensity on the surface of the street so that traffic of all kinds might pass over it in perfect safety. It seemed to him, from the point of view of a sufficient and uniform intensity, that the great mistake made with regard to electric lighting was the fixing of columns at fairly large distances apart, and each giving out a light of great intensity, at a considerable height. This resulted in dark and sharp shadows, which were certainly objectionable, most confusing, and dangerous. When they remembered that light cost money to produce, it seemed false economy to place the lights high above the street, and at great distances apart, because it appeared to him impossible to get uniformity by lighting in this way. He thought the most reasonable thing was to have the light at pretty frequent intervals, so as to get, not an intense light over a small area, but as uniform a light as possible, of sufficient intensity, all over the surface of the street. In this way alone could streets be satisfactorily lighted. With gas it was not necessary to place the lights at all high, so that it was possible to obtain a very large percentage of the light down on the surface of the street, instead of wasting it in the air. Those who had seen the high-pressure lighting in Queen Victoria Street and Aldwych would, he thought, agree that it was about as perfect as it could be. There were no black, sharply defined shadows, but a wonderful uniformity of intensity of lighting. He would very much like Mr. Blakey to give them some little information as to the effect of the great heat upon the lanterns. He noticed in Aldwych that the enamelled tops of the lanterns were beginning to have a brown appearance; while in several cases the enamel had already been destroyed. Mr. Blakey might perhaps also give them the cost of re-mantling. There was another installation of high-pressure lighting to which attention might be called. This was at Broad Street Station, where a light of 17,700-candle power was obtained at a cost of 1s. 8½d. per hour. He did not think electricity would ever get anywhere near this.

In the course of his reply, Mr. Blakey said that the lamps to which the President had referred were manufactured in England; if they had been made in Germany there would have been no burnt tops. There was no method in this country of hardening the reflector; and if the work had been done in Dresden and Lower Saxony, there would have been no marks. With regard to mantles, these could, he was pleased to say, now be made better in England than anywhere else in the world. The mantle was not generally a serious matter with high-pressure lighting, except where there was extensive vibration. With ordinary care, outside mantles ought to run 200 hours, though they might not do it in practice. He thought, however, that the probability was that they would soon last a great deal longer. A Mr. Ladd had been experimenting for two years, and had a mantle to-day that was like a piece of porcelain. He was losing 15 per cent. of the light now; but if he could overcome this, he had solved the difficulty, and it might be possible to keep a mantle a year. Even, however, if they lost 10 per cent. in light, this would be preferable to present conditions.

The proceedings concluded with a vote of thanks—proposed by the Hon. Secretary (Mr. Henry Capsey)—to the President for occupying the chair.

LONDON AND SOUTHERN DISTRICT JUNIOR GAS ASSOCIATION.

A Meeting of the Association was held last Friday, at the Regent Street Polytechnic—the PRESIDENT (Mr. W. Grafton) in the chair. The business consisted of a communication by Mr. J. G. CLARK, of the Gaslight and Coke Company, entitled

SOME MODIFICATIONS OF THE HARCOURT TABLE PHOTOMETER.

The table photometer prescribed for testing London gas may, for the purposes of this paper, be considered as composed of a photoped, Harcourt 10-candle standard, and argand burner. The two latter pieces of apparatus will henceforth be referred to as the standard and argand. This photometer was designed for testing gas at fixed flame values by adjusting the rate of consumption; the value at which it was decided to make the test being defined by the relative distances of the standard and argand from the photoped. No provision was made to enable an operator to test gas at fixed rates of consumption, which would require some means by which the relative distances of the standard and argand from the photoped could be varied at will. There are three ways in which this may be done: (1) By moving the standard, having the argand and photoped fixed; (2) by moving the argand, having the standard and photoped fixed; (3) by moving the photoped, having the standard and argand fixed.

The first is unsatisfactory, because any attempt to use the standard otherwise than as a fixture is likely to seriously impair its value as a standard of light.

The second method is embodied in an apparatus patented by Mr. G. C. Trewby. In this design, the argand is mounted upon a carriage which is provided with rollers and made to run upon

a graduated bar. The carriage is moved by means of a cord and pulley or screw, so arranged that the operator can make the adjustment while observing the photoped. The graduated bar which guides the carriage is set at the correct angle, so that the rays from the argand flame are incident upon the photoped at a constant angle. The gas is supplied to the argand by means of a flexible tube, or some other suitable arrangement which will not retard the free motion of the carriage.

With this apparatus, it is possible to test gas within practical limits at (*a*) any flame value, or (*b*) any rate of consumption. In the case of (*a*) the carriage is moved until its pointer corresponds with the mark on the bar indicating the required flame value. The rate is then adjusted until equality of illumination of the photoped is attained, and this rate measured. In the case of (*b*) the rate is regulated to that at which it is required to test the gas, and the carriage is then moved along the graduated bar until the photoped is equally illuminated. The value of the flame can then be ascertained from the position of the carriage upon the graduated bar. In order to make it possible to test gas at flame values above 20 candles, an extension of the table is necessary to support the graduated bar.

The third method is that of moving the photoped, having the standard and argand fixed. It was at the suggestion of Mr. J. N. Reeson, the Resident Engineer at the St. Pancras Gas-Works, that several photopeds were arranged upon the table in the positions indicated in fig. 1. As there shown, they were placed equidistant (1000 mm.) from the standard, but at various distances from the argand. These distances corresponded to 16, 17, 18, 19, and 20 candles respectively, so that tests could be made at any of these values. Thus, if it was required to make a test at 17-candle value, the rate would be adjusted to give equality of illumination upon the photoped representing that value, and the rate measured in the usual way. The efficiency of the burner per cubic foot or 5 cubic feet may then be easily calculated.

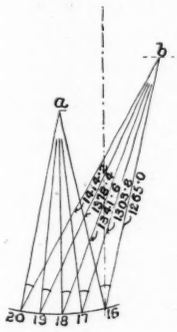


FIG. 1.

It soon became evident that, if mechanism could be devised by means of which a single photoped could be moved to correspond with any flame value, it would enable an operator, not only to test gas at any intermediate flame value, but also at any rate of consumption. It will be seen, on looking at fig. 1, that the angle subtended at the photoped by the centres of the flames is more acute the greater the distance the argand is from the photoped. The special value of the photoped depends on the perfect juxtaposition of the rectangular spaces illuminated by the flames; and in order to preserve such alignment, it is essential that either the angle subtended at the photoped remains constant, or that the distance between the slotted diaphragm and the illuminated surface of the photoped should be varied accordingly as the distance of the argand from the photoped varies. It was difficult to automatically make such a delicate adjustment as the latter; and therefore an endeavour was made to so arrange the travel of the photoped that the angle subtended at it by the lights remained constant.

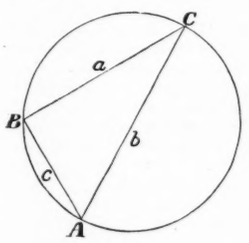


FIG. 2.

According to Euclid, Book III., Prop. 21, the angles in the same segment of a circle are equal to one another, and therefore angle A, C, B will be constant at whatever point of the circumference of the segment C is chosen. See fig. 2. If now the standard and argand be considered as being placed at A and B, and the photoped at C, then as C moves along the circumference of the segment B C A, the lines B C and A C will vary in length, but the angle formed by them will remain constant. The radius of this circle in terms of the sides of the triangle *a*, *b*, *c* will be

$$R = \frac{a\,b\,c}{4\sqrt{s\,(s-a)\,(s-b)\,(s-c)}} \quad \text{(I)}$$

where

$$S = \frac{a+b+c}{2}$$

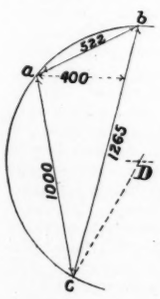


FIG. 3.

Fig. 3 shows the arrangement of the lights and photoped as prescribed by the Metropolitan Gas Referees for testing gas at a 16-candle flame value. The radius of the circle that will enclose the triangle *a*, *b*, *c* is given by formula (1).

Here

$$S = \frac{1265 + 1000 + 522}{2} = 1393{\cdot}5$$

so that

$$R = \frac{1265 \times 1000 \times 522}{4\sqrt{1393{\cdot}5 \times 128{\cdot}5 \times 393{\cdot}5 \times 871{\cdot}5}} = 666{\cdot}2$$

This is the radius of the circle along which the photoped must move; the centre being at D.

The apparatus is set up as follows: The photoped is mounted upon a carriage, as shown in fig. 4. The centre-rod passes through a collar at the top into a bearing at the bottom, so that

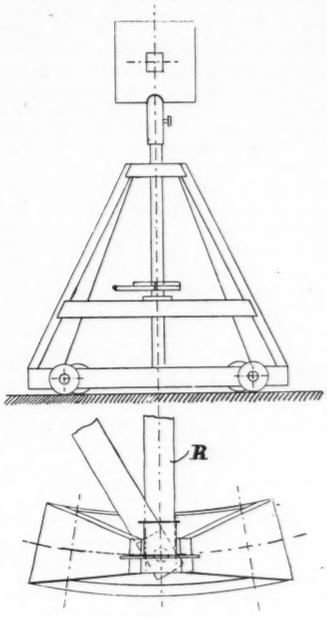


FIG. 4.

it is free to turn in the carriage. The photoped is set upon the top of the rod, the axis of which must be plumb with the face of the photoped upon which the paper is placed. A set-screw serves to fasten the photoped in its correct position. A flat bar R, with centres drilled at each end 666·2 mm. apart, is fastened to the frame of the carriage, as shown in fig. 4, with one of its centres coincident with the axis of the centre-rod. Another bar about 1150 mm. in length has a centre drilled at one end and a slot at the other. This is attached by screws to a plate brazed upon the centre-rod, so that the centres of each are identical. These bars are conveniently made of hard wood, with brass ends for the centres and slot.

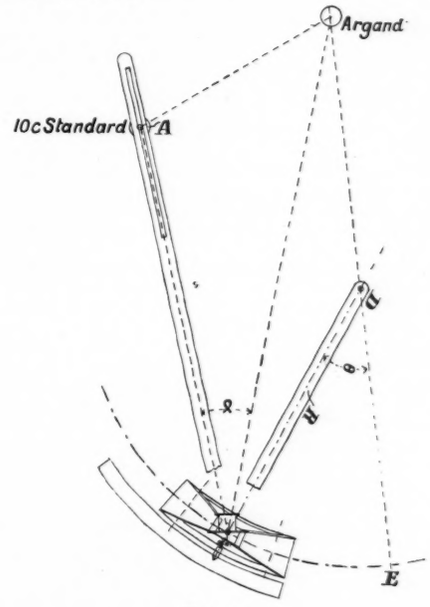


FIG. 5.

A pillar A (fig. 5), with a turned centre at the top, is set up under, and plumb with, the centre of the standard, and another,

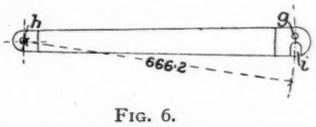


FIG. 6.

D, set up 666·2 mm. from A and the argand. The adjustment of the pillar D is facilitated by the use of a standard distance bar of the form shown in fig. 6. Having adjusted the pillar A by

means of a plumb bob, the centre g of the distance bar is fitted upon it and the centre h fitted upon D. Then keeping the pillar D still, the bar is lifted from A and turned round until the gap i embraces the pillar supporting the argand burner. If it does not do so, the position of D must be altered, and the above operation repeated until found correct. The pillars, having been correctly placed, are fastened to the table. The carriage with the bars attached may now be put upon the table, so that the slot of the longer bar rests upon the pillar A under the standard; the turned centre fitting accurately into the slot, and the free centre of the bar R fitting upon the pillar at D (fig. 5). The heights of these pillars should be such as to support the bars in a horizontal position.

If now the carriage be moved, the centre of the photoped will traverse a circle of which the bar R is the radius and the angle α will remain constant. As the centre-rod with the photoped attached is fastened to the slotted bar, the plane of the photoped will keep a constant angular relation with the rays from the lights. It only remains now to set the photoped so that the rays from the lights fall upon it at equal angles—an operation which is facilitated by the mirror attached to it. The carriage may now be moved to positions corresponding to any flame value; the photoped being always correctly adjusted by the link motion described above. It is well to provide the carriage with a sufficiently large wheel-base, in order to ensure stability; and a track of metal renders the motion of the carriage easy.

It is necessary to enlarge the apertures in the screen which stands between the lights and the photoped, so that there will be no obstruction of the rays as the photoped is moved, round and also to make another aperture to permit the free motion of the slotted bar. A slight alteration must be made to the conical draught-screen which surrounds the flame of the standard. The prescribed dimensions for the opening in this screen are 38 mm. within and 34 mm. without; but if these are made 10 mm. larger, there will be no interception of light at any of the positions occupied by the photoped between 14 and 25 candles. The range over which the instrument may be used will depend upon the length of the slot in the longer bar. With the dimensions given of this bar (fig. 6), a range of from 14 to 23 candles is possible—that is, of course, assuming a 10-candle standard is used.

The following is a method of calculating the scale to read candles directly. Fig. 7 shows the chief points of the apparatus. The points A B and C indicate the centres of the Harcourt standard, argand burner, and photoped respectively. Let D be the centre about which the photoped turns, then D C represents the radius-bar which guides the carriage as described above. It is convenient to define the position of the photoped by the angular displacemen θ of the radius-bar D C from the line B D E, which is a diameter of the circle having the argand at one of its extremities.

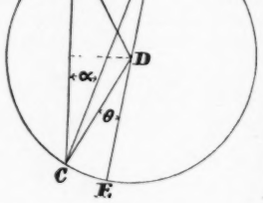


FIG. 7.

A C and B C are the respective distances of the standard and the argand from the photoped. It follows, from the law of inverse squares, that if equality of illumination is obtained in the position in fig. 7, the illuminating power of B = the illuminating power of $A \times \left(\frac{BC}{AC}\right)^2$ which, when the 10-candle standard is used, becomes

$$10 \times \left(\frac{BC}{AC}\right)^2$$

By trigonometry, we get

$$\frac{BC}{2R} = \text{Cos}\,\frac{\theta}{2}$$

and

$$\frac{AC}{2R} = \text{Cos}\left(\alpha + \frac{\theta}{2}\right)$$

$$\therefore \left(\frac{BC}{AC}\right)^2 = \left\{\frac{\text{Cos}\,\frac{\theta}{2}}{\text{Cos}\left(\alpha + \frac{\theta}{2}\right)}\right\}^2 \qquad (2)$$

Putting $\left(\frac{BC}{AC}\right)^2 = m$ we get

$$\theta = 2\ \text{Tan}^{-1}\frac{\sqrt{m}\,\text{Cos}\,\alpha - 1}{\sqrt{m}\,\text{Sin}\,\alpha} \qquad (3)$$

Since m is the ratio of the squares of the distances, it is equal to the illuminating value divided by the value of the standard, which in this case is 10. After inserting the numerical values of the constants in Equation 3, we get

$$\theta = 2\ \text{Tan}^{-1}\frac{\cdot 9200\sqrt{m} - 1}{\cdot 3918\sqrt{m}}$$

By substituting for m any desired value, the corresponding value of θ is readily obtained.

Example I.—Let it be required to find the angular displacement that will correspond to an illuminating value of 20 candles. In this case,

$$\sqrt{m} = \sqrt{\frac{20}{10}} = 1{\cdot}4142$$

$$\therefore \theta = 2\ \text{Tan}^{-1}\frac{(\cdot 9200 \times 1{\cdot}4142) - 1}{\cdot 3918 \times 1{\cdot}4142}$$

$$= 2\ \text{Tan}^{-1}\cdot 5433$$

A table of tangents gives

$$\text{Tan}^{-1}\cdot 5433 = 28{\cdot}52$$

$$\therefore \theta = 2 \times 28{\cdot}52 = 57{\cdot}04^\circ$$

Hence, 57·04° is the displacement of the radius-bar R from B D E (see fig. 7) corresponding to 20 candles.

Example II.—Required, the angular displacement that corresponds to 14 candles. In this case,

$$\sqrt{m} = \sqrt{\frac{14}{10}} = 1{\cdot}1832$$

$$\therefore \theta = 2\ \text{Tan}^{-1}\frac{(\cdot 9200 \times 1{\cdot}1832) - 1}{\cdot 3918 \times 1{\cdot}1832}$$

$$= 21{\cdot}6^\circ$$

These calculations may be repeated for other values, and a complete scale constructed. The scale is a circular one described from D, with a radius that will reach a little beyond the base of the carriage to which is attached a pointer indicating the position of the photoped upon the scale.

In all the calculations given above, I have assumed that the position occupied by the photoped when at 16 candles is identical with that prescribed by the Gas Referees for testing gas at a 16-candle flame value. This is, however, by no means necessary; the essential condition being that the photoped traverses a circle containing it and the two lights.

Discussion.

The PRESIDENT said the paper dealt with an innovation, and was exceedingly interesting. It, however, certainly deserved some criticism.

Mr. GRIMWOOD remarked that, under the circumstances of the new method of testing London gas, the modification of the table photometer that had been outlined should undoubtedly be considered. He would like to ask a question which he did not think had been answered in the paper, as to what were the advantages claimed for this arrangement over the patent procured by Mr. G. C. Trewby for moving the argand burner. He fully agreed that it was impossible, with the present Harcourt 10-candle lamp, to move the standard. He did not know whether the method of cutting the screen of the lamp would be allowed by the Referees. They were very particular; and Mr. Clark reckoned that it was necessary, in order to work his apparatus, to cut 10 mm. off the screen. The Referees looked very closely after their requirements; and whether they would permit this alteration of the measurements with the Harcourt lamp—even though it would not make a difference to the candle power—was, he thought, very doubtful.

Mr. CLARK pointed out that he preferred to enlarge the aperture rather than turn the hood.

The PRESIDENT said that, taking first fig. 1, the weakness there was the varying distances and the more acute angle—in spite of what Mr. Clark had said about this angle being constant. The great advantage about the whole business was the modification shown in fig. 4, and also in fig. 5. But while this was satisfactory, he did not quite follow the author's arguments. There was a standard distance given to the photoped of 1000 mm. on the Referees' table; and this it was proposed should be departed from. That was to say, the most convenient figure of 1000 mm. was to be exchanged for an ever-varying one, according to the position of the photoped to the standard. It was also varying (although the angle might be perfectly accurate) to the extent that the hood of the standard would require turning round—not necessarily made wider, but simply adjusted, and this meant getting off one's seat. Then, again, as they had to take into account the future requirements for the testing of other lights besides the argand flame, it was necessary to consider the applicability of the arrangement for this purpose. Could the idea be modified to suit a flat-flame test? As to the pillar D in fig. 5, it seemed that in ordinary practice it would be difficult to get the 666·2 mm. A gauge would have to be given; and one might break the argand before getting the position. Two things, he thought, should be fixed—the standard and the photoped; but it would be better to fix the two lights. They were going to depart from fixed lights, inasmuch as they were going to burn the gas at what was called a fixed rate. He did not like to speak of it as a fixed rate, because it was not quite fixed—it was changeable according to the temperature and barometric pressure. But assuming it was fixed, something was always varying—namely, the candle value of the flame. This meant something that was not easily governed. It meant also either the movement of the light or the disc. This was the distinct feature of Mr. Clark's arrangement, that he fixed both the gas-burner and the standard, but moved the photoped. Therefore the two things were fixed; and two things must be fixed in order to get reasonable equality. If two things were moving, they would never know where they were. Then another thing not touched upon by the author was the photoped paper, used as the indicator of equality

of light. They were told that if they took an even-grained paper they got equality; but it did not follow. There was a certain amount of oiliness about very thin paper—that was to say, it was too translucent—which tended to prevent certain and positive equalization of colour or intensity; and the standard was not always the same colour as the gaslight. That point was very difficult to arrive at, and therefore white paper should not be used; it should be a tinted paper. The fixed light was certainly one thing that must be taken into consideration; and he was afraid that, as the matter stood at present, they would get two lights opposed to one another, with something in between, rather than the moving light as with the Trewby photometer. The 1000 mm. was a fairly long distance away from the photoped; and if they reduced it, it did not help them very much. They were getting nearer to the centre of the bar, and thus the difficulty was greater of arriving at equalization of intensity. They could move the arrangement perhaps half-a-candle, and it seemed quite right. This was the difficulty when they had the moving light, as indicated by this instrument. With the flat-flame burner the intensity of the light would be very different from the intensity of the "London" argand. They should also consider the commercial use of the instrument—namely, the testing of incandescent lights. Why not be able to set up, instead of the argand or flat flame, an incandescent light, and arrive at its value by the same method on the same instrument? This would certainly be a step forward any way. He was sorry Mr. Clark had not been able to give them any round figures, so that the members might have grasped the idea more clearly than it was possible to do by means of a mathematical description, however admirable. The subject was one not easily appreciated by the novice. In other respects, the paper was excellent.

Mr. CLARK, in reply, said Mr. Grimwood had asked what advantages the instrument described had over Mr. Trewby's invention. He had not had very much experience with the Trewby photometer; and he was therefore afraid he could not make any comparisons between the two. He merely took the three methods by which the adjustment could be made—namely, by moving the standard, the argand, or the photoped—and discussed them. As to the alteration of the screen, he had made the aperture larger. Mr. Grimwood said it would be better to turn it round; but it would be rather troublesome to have to get up from one's seat to do this. He could not see that an increase in the width of the aperture of 10 mm. would affect the flame very much. The opening at present was 34 and 38 mm. He had made it 10 mm. larger. This was ample to meet all requirements; and it was not necessary to move from the seat while taking observations. As to variable distances, the instrument he had explained in the latter part of his paper compared somewhat with the bar photometer, where the disc was moved with the two lights fixed. Of course, as they moved the disc, both distances were varying. This was a comparison with the method he had described—they were, he thought, analogous. It was not, so far as he knew, found a great objection with the bar photometer. As to the use of a flat flame, unfortunately with the instrument he had described this did present difficulties, because as the photoped must be moved round, the burner would have to be moved round also. With the argand they had a symmetrical flame, so that the light measured horizontally would be the same all round. But with the flat-flame burner this was by no means the case; and it would be necessary to get up and alter the position of the burner for every position of the photoped. This, of course, would apply also to other kinds of light, if the distribution was not symmetrical. Mr. Grafton had said something about breaking the argand in the setting of the pillar. He (Mr. Clark) had not found any difficulty in this respect. The method of setting was to first get the lamp fixed up accurately; then to set the argand burner, which was 522 mm. from the lamp; and then fix the pillar under the lamp by means of a plumb bob. Then he had a distance bar which was 666·2 mm. between centres; and this enabled him to set the other pillar D accurately in a very few minutes. Of course, when once it was fixed, there was no trouble afterwards unless one had to move the apparatus.

Mr. CARPENTER: Are you using a photometer of this kind?

Mr. CLARK: Yes; I had one made some time ago. Of course, the method of operation is very simple. You merely sit down and move the carriage round until equality of illumination is attained; and then read off the scale the value corresponding to the position. The special feature of the instrument is that the candle value at which tests can be made is variable. You can work at the constant rate or constant flame value. The fact of your being able to measure any flame-value, permits you to use any rate, just as is done with the Trewby instrument.

The PRESIDENT: Within the limits of 14 and 20 candles?

Mr. CLARK: Yes. As a matter of fact, with the arrangement I have you can make it very much more than 20.

The PRESIDENT: How much below 14 candles can you conveniently go on the table?

Mr. CLARK: Down to 10 candles, if you like.

The PRESIDENT: You could not go higher than 25 candles, at the outside; and the meter and other apparatus would have to be in another position than as at present arranged on the table?

Mr. CLARK: The length of the slotted bar limits the range of the apparatus; and you can make that as long as you like. Theoretically, one can get as high a power as desired.

A vote of thanks to Mr. Clark concluded the proceedings.

MANCHESTER AND DISTRICT JUNIOR GAS ASSOCIATION.

A Meeting of this Association was held at the Manchester Schoo of Technology on Saturday, at which there was a fair attendance of members. The subject was to discuss certain questions which the members had previously had submitted to them. The first question was—

On what lines should a gas department work to compete with the installation of suction-gas plants for power purposes?

Mr. W. HALL, in answering this question, said it was rather a knotty one, and required a good deal of consideration, owing, first, to the fact that practically two-thirds of the coal gas manufactured was used for power purposes; and, secondly, taking into consideration the reduction in gas consumption owing to incandescent installations. For these two reasons he thought the question should be immediately looked into by the heads of all gas departments, with a view to bringing forward some practical scheme, to compete with suction gas, which he had no doubt was the gas of the future for power purposes. At present, this new system had many advantages over the present one, besides being considerably less costly in the production of gas, which he need not mention. There seemed to be two main lines of competition, and he would take the comparative cost of the two systems. Supposing 20-horse power was required for one year for ten hours per day for 300 days, the cost would be as follows:—

Gas-Engine with Coal Gas at 1s. per 1000 Cubic Feet.

Gas, 17 cubic feet per B.H.P. per horse	£51 0 0
Labour, one hour per day, at 6d.	7 10 0
Interest, depreciation, &c., 10 per cent.	13 0 0
Total	£71 10 0

Suction-Gas Engine with Anthracite at 22s. per Ton.

Fuel, 1 lb. per B.H.P. per horse	£29 10 0
Water, 3 gallons per B H.P. per horse	4 10 0
Labour, two hours per day (including everything)	15 0 0
Interest, depreciation, &c.	20 0 0
Total	£69 0 0

From these figures it would be seen that coal gas must be made and sold at 1s. per 1000 cubic feet in order to be equivalent to gas made by a suction-gas plant. This seemed to be an impossible figure for illuminating gas; and gas departments might consider the advisability of making a special water gas, and distributing it by separate mains. In his opinion, this scheme would be out of the question—the first cost being too great. There was, moreover, increased danger from underground leakages, owing to the large quantity of carbon monoxide (approximately 38 per cent.) which this gas contained. However, it might be feasible to make a low-grade gas, and distribute it at high pressure in separate mains, which could be made adaptable for high-pressure lighting, as well as for power, cooking, and heating purposes; and it should be supplied to consumers through special meters at the lowest possible rate. He thought if this scheme could be carried out in a practical manner, it would meet all competition, and would be a further inducement to dispense with the present coal-fire. Gas as at present supplied would never be made use of to any great extent for power or heating until the price was brought within the reach of the users. He found that many gas cooking-stoves which had been supplied and fixed free by gas departments, were not used as often as they were intended to be when first fixed, owing to the consumer finding out, after about the first quarter's bill, that the cost for the gas consumed was greater than he had bargained for. The result was that there was less cooking done by gas, and more by the coal-fire.

Mr. ALSOP remarked that the duties, briefly, of gas suppliers were to make gas—as much of it as possible—and to sell it; and with every thousand cubic feet sold to make a distinct profit. There was no reason why any gas department should attempt to sell gas too cheap. It must not be sold at a loss to any particular party or parties, no matter what use it might be put to, and the balance of loss made up by other consumers, so that a suction-gas plant—a recognized competitor—might be kept out of the district. Unless these plants were of a large size, they were not much to be feared where gas could be sold at 1s. 6d. per 1000 cubic feet. This figure was lower in some cases—viz., Sheffield, with 1s. 2d. minimum and 1s. 6d. maximum, Stockport with 1s. 6d., Widnes, and other places. The way to meet the competition was to ascertain what the cost of gas, distribution, interest and sinking fund, standing charges, &c., came to per 1000 cubic feet; and then, so long as no consumer had his gas below this figure, this might be said to be the fullest extent to which any gas department, pursuing a sound commercial policy, ought to go. The axiom of most successful business men of the day was "Small profits and quick returns;" and a merchant, in dealing with customers, did not say, "I must charge all alike;" he took each case on its merits (with certain limits), and to the big buyer he offered special terms. The members would have observed how the standing charges and interest and sinking fund charges were less per 1000 cubic feet for the consumer who had a good load-factor. Therefore a good reason existed why some allowance should be

made. As to competition, it might be put briefly thus: (*a*) Gas *v.* suction-gas plant, &c., for power; (*b*) gas *v.* electricity for power; (*c*) gas *v.* coal for cooking, fires, &c. For lighting, he thought it could safely be said that in most cases gas held its own; and therefore it did not call for as much reduction in price. It was the particular competition that must rule the gas supplier in his charges for gas used or consumed. The system of differential charges was, he ventured to suggest, the sole reason why so many towns, such as Nottingham, Leicester, Darlington, St. Helens, Glasgow, Stockport, and others, had adopted the system, so as to meet the competitions already mentioned. He thought they would find that it paid them, and was a distinct advantage, and also the best way of keeping consumers from venturing into becoming makers of their own power gas. What was now wanted by the conductors of gas-works, particularly those owned by municipalities, was relief from heavy contribution towards the rates, which was too often the sole cause for keeping up the price of gas to lighting consumers.

Another question raised was—

> In the washing of the crude gas for the elimination of ammonia, what would be considered the best method to adopt; and is it possible to so wash it as to have part of the ammonia left in the gas without it showing by the qualitative test with litmus, this being neutralized by excess of acid compounds also contained in the washed gas?

Mr. S. W. Townsend said, in answering this question, there was no doubt that the best method to adopt in washing crude gas for the elimination of ammonia was to pass the gas first through some form of washer, next through one or more tower scrubbers, and lastly through some form of washer-scrubber fed with clean water. Liquor should be pumped through the washer and scrubber, in order to get it as strong as possible, and so that it might remove as much sulphuretted hydrogen and carbonic acid as possible. With regard to the second part of the question, if there were more than 3 grains of ammonia per 100 cubic feet in the gas, the test with litmus paper would show it. Lower quantities than this did not show, even if the gas was purified from sulphuretted hydrogen and carbonic acid. Both of these gases were very feebly acid—in fact, carbonic acid was not so at all, except in solution; and their effect on what was only a qualitative test was negligible. It might be of interest to give the results, in grains per 100 cubic feet, of some recent tests for ammonia in the gas in different parts of the plant. Ascension-pipe, 560; inlet to the tar-extractor, 312; outlet of the tower scrubber, 50; outlet of the washer-scrubber, 2.

Several members having spoken on these and other matters brought forward, the meeting terminated.

SCOTTISH JUNIOR GAS ASSOCIATION.

Eastern District.

The Quarterly Meeting of the Scottish Junior Gas Association—Eastern District—was held in the Heriot-Watt College, Edinburgh, on Saturday last. Mr. J. Dickson, of Dunfermline, the President, occupied the chair, and said it was with the greatest pleasure that he saw so good an attendance of members at their first quarterly meeting for the session, coming as it did in the middle of December. However, those who had found it convenient to attend would have the pleasure of listening to two practical papers, by gentlemen well qualified to deal with the subjects they had chosen. Mr. Simpson, as the Manager of a small works, had many varied experiences in working and in distribution; while Mr. Mitchell, the General Foreman in the Dundee Gas-Works, would submit a very practical and up-to-date paper on "Retort Settings in Relation to Carbonization"—a subject upon which he was well qualified to speak.

Mr. James Simpson, the Manager of the Inverkeithing Gas Company, read a paper on

EXPERIENCES IN A SMALL GAS-WORKS.

He said that, in taking over a small gas-works, one of the first things a manager found was that, instead of having only one department to look after, all the different ones were under his individual care. The first place which claimed his attention was the retort-house, which, in a small works, required a great deal of supervision—due mainly to want of storage capacity, which was very often inadequate for the daily demands. Taking the storage at his works, which was only 39 per cent. of the maximum daily output, they had, of necessity, to keep more retorts working, alternately making gas and hanging off. This would be avoided if their storage capacity were increased. They would also have more coke for disposal, besides obviating a loss in illuminating power, as well as injury to plant. He considered that small works should have at least 70 per cent. storage. The practice of damping retort-settings at night should be done away with, because it reduced not only the illuminating power, but also the make of gas per ton of coal carbonized.

One of the great drawbacks in a small works was the amount of back-pressure on the retorts, due to the want of an exhauster, which, in a works with a make of only 2 million cubic feet per annum, such as his, would be unprofitable. The retorts should be kept as free from carbon as possible. Never allow it to get thick, as, in scurfing, the retort was often badly shaken. The body of the setting required a good deal of attention, because, if it was allowed to get out of repair, a great amount of heat was lost, and the yield of gas considerably diminished. This was the case in his works, where the settings were so severely racked and strained for the want of proper binding that it was impossible to get more than 6000 cubic feet of gas per ton of coal. The sittings were direct-fired. Recently they had a shallow regenerative setting put in—three retorts in the setting—and they were now getting a yield of 9000 cubic feet per ton, which he considered to be a fair result, without the aid of an exhauster. Their ascension-pipes were 5 inches in diameter, with 4-inch dip-pipes. The hydraulic main was 15 inches in diameter. The gas, tar, and liquor, escaped together, from the end of a main, by a 5-inch pipe. The depth of seal in the hydraulic main was 1 inch. They had a good deal of trouble at first, as the dip-pipes were of varying depths—from 2 to 4½ inches—which put a great amount of back-pressure on the retorts.

In a small works, distribution demanded a large amount of the manager's time and attention, especially where the mains were very shallow, such as had been the case at Inverkeithing. In some cases, the mains had only 4 inches of cover; and whenever any heavy traffic passed over them, there was sure to be breakage. There was no station meter at the works, therefore they had no way of ascertaining what the losses were; but things were so bad that they began to make tests during the day with a 60-light meter. They found they were losing one-third of the make. They then placed valves on all the mains throughout the town, dividing it into sections, so that each section could be tested separately. This gave every satisfaction, as the greater amount of leakage was found to be in two sections only, which they relaid. The leakage was now reduced to 7 per cent. The valves were very handy, because when any serious leak took place one section could be cut off, leaving the rest undisturbed. This, of course, could only be done where there was a complete circuit. He thought that if valves were more widely used there would be a considerable saving, especially in small towns and places in the vicinity of collieries, where there was much subsidence.

Discussion.

Mr. W. Brown (Lasswade) said that it was quite true, as Mr. Simpson had said, that, generally speaking, the storage in small works was very far from what was required. At his own works, he had only 55 per cent. of storage accommodation. This was all very well so long as the weather kept fairly mild and clear; but in severe weather it was otherwise. He had found that the introduction of glazed retorts effected a great saving in the matter of carbon. He had such retorts, which had been working for more than nine months; and he had never had to take a particle of carbon off them. Perhaps once a week the men gave them a clean-out with a rake; and the retorts then went on for a period of two years without any trouble. The management of the retort-settings was a thing which gas managers, particularly of small works, should have under their own care and supervision. He had known men to say the flues were properly cleaned out, and yet a good heat could not be got; but on looking into the matter it was found that the flues would be choked up. He made it a point to examine the flues himself every month; and on this account they had better heats and an increased yield of gas. He did not think the quantity produced was altogether a correct method of ascertaining the yield. He knew a works where 75 per cent. of cannel was used; and it would not be fair to compare these with works such as his, where only 15 per cent. of cannel was employed. As to the distribution of gas, he did not know whether Mr. Simpson had his pipes running through woods, as he had; but during the past summer he had had two rather rough experiences, through the roots of trees having broken pipes, which led to the loss of a great quantity of gas.

Mr. A. Masterton (Edinburgh) said that Mr. Simpson's views would no doubt appeal to a great number of those present. If they could have all his suggestions carried out, he felt sure the result would more than justify the outlay that would be incurred. He agreed that in small works the storage was often quite inadequate; and if Directors could only be brought to see it to be so, they would soon save the cost of extra storage capacity, in the decreased expense of working in the retort-house, in wear and tear, and in fuel. It would also give the manager more time to devote to other departments. Even in small works, he approved of the semi-regenerative form of setting, because he had found that where a good substantial job had been made at first, repairs and maintenance had been comparatively small, once men got into the way of working them and regulating the draught. This was a most vital point, both in connection with the manufacture of the gas and the utilization of the fuel to the best advantage. The seal in the hydraulic main should be kept as low as possible, consistent with safety, and should not be below an inch. It was advisable also to test the depth of seal from time to time, so as to ascertain that no increase had occurred. Then he would advise that the tar should be taken off the main as quickly as possible, and separately, and that the dip-pipes should be sealed in liquor only. Thorough condensation should be enforced, and he would urge the use of an exhauster, even in

small works such as Mr. Simpson had described, as by its use they would have an increased make of gas and a saving in the upkeep of the retorts and settings. It was most essential that the retorts should be kept quite free of carbon, as its presence was most deleterious. He must confess he was surprised to learn of the shallowness of the mains in Mr. Simpson's district. In his opinion, the cover should never be less than 2 feet; and if mains were laid properly at this depth, they should not give much trouble, and require little attention. Great care should be exercised in the fixing of the service-pipes. It should be seen that they were thoroughly tight and properly bedded, and that there was a good fall to the main. In his opinion, the fixing of valves upon the main was a very good idea; and he would suggest a simple method of doing this, instead of using rack-and-pinion valves, which often became stiff for want of being used. An effective valve might be found in a thorough-going syphon valve, with a partition across it, reaching down to about 6 inches of the bottom. If it was decided to shut off a portion of the main, water could be let into the trap. Of course, the mains must be laid to fall away from the syphon, to prevent condensation. A station meter was an indispensable apparatus in all works, large or small; and he thought the importance of it was too self-evident to require advocating.

Mr. H. Rule (Falkirk) considered that, instead of being equal to 70 per cent., the storage should be equal to the maximum day's output; but, of course, this depended a good deal upon local circumstances. He knew of an instance in which, some years ago, a T-piece was being put into a main, and an accident occurred by which four men were gassed. If there had been valves at both ends of the street this would not have happened, and the loss of gas would have been avoided.

Mr. J. R. Moyes (Edinburgh) asked if Mr. Simpson was using the same class of coal when he got 9000 cubic feet of gas as when he got 6000 cubic feet.

Mr. J. D. Keillor (Kirkcaldy) asked how Mr. Simpson arrived at the amount of the leakage and the make per ton.

The President, in closing the discussion, said perhaps there was no more arduous position occupied by those associated with the gas industry than that of manager of small works with low storage capacity; and this was probably the chief reason why Mr. Simpson had been unable to give them more of his experiences. The storage accommodation at Inverkeithing was, as Mr. Simpson had said, only 39 per cent. of the maximum daily output; and therefore it was at once apparent that this gentleman must find himself in difficulties many times throughout the winter. The holder capacity generally provided was equal to 24 hours' maximum production; but in many places they found managers in the same position as Mr. Simpson. The advantage of storage over and above the maximum daily production was found especially in manufacturing towns, where, during the winter months, it was always the case that the holders dropped considerably towards the week-end, and often Saturday and Sunday were found to be the days upon which the smallest consumption occurred. This, of course, was owing to the factories, which were by far the largest consumers, being closed that day. It was then that the benefit of ample storage manifested itself; for it was possible—provided, of course, that the carbonizing plant was equal to the occasion—to start the week with full holders; and though the consumption of gas might during that time prove greater than the production, the loss could be regained at the end of the week. Mr. Simpson's remarks as to the loss of gas, due to back-pressure and the accumulation and removal of carbon were very much to the point; and there were few works, however small, where an exhauster could not be made to pay. The yield of 9000 cubic feet of gas per ton of coal pointed to good heating and careful working; and should an exhauster be found to be expedient, this figure would certainly be much improved. The accumulation of carbon inside the retorts had always proved troublesome; and its removal by the chisel bar was undoubtedly hard upon the retorts. With hand-charged retorts, the tendency for carbon to accumulate was greater than with machine charging, especially as in the latter case it was necessary to open a fair number of lids at a time. The carbon was then exposed for a certain period to a current of air. In the case of hand charging, each retort was generally drawn and charged separately, and the lid closed, so that the air had not the same chance to loosen and burn the carbon. Then, again, in the case of machine charging by the manual charger, the trolly wheels were constantly acting as a breaker-up of any carbon that might deposit on the bottom of the retort; and its deposition at the back was checked very considerably—the trolly striking there each time the retort was charged. However, in spite of all, the carbon was still with them, and was likely to be; and though there were a few patents on the market for its removal, there was not one for its prevention, except that which Mr. Brown had mentioned—glazed retorts. As to its removal, the best that could be done was to periodically scurf the retorts, and not to allow it to gather to so great an extent as to affect the weight of the charge or the heats; for when allowed to accumulate to this extent its removal became very trying work. Its deposition could be lessened to a great extent by the employment of an exhauster and by having a light seal in the hydraulic main. A level gauge or a slight back-pressure in the retort, provided the exhauster was well regulated, acted as a great help towards the attainment of this end. It was found advantageous in their case to take the pressures on the ascension-pipes by means of a gauge, in order to find out whether there was a vacuum or a pressure inside the retort. Mr. Simpson's energy in tackling the question of heavy leakage had its own reward. His suggestion as to the fixing of valves on main-pipes had not been generally carried out, mainly, he supposed, on account of the danger of chokes, and the tendency of the gas to lose pressure in passing through the stop-cock barrel. At the same time, it was worth consideration in such places as those indicated. He might mention that, when not so hard pressed for time, Mr. Simpson intended to do more for the members in the way of paper writing; and he (the President) was sure they would all be very pleased to learn of him anything which might prove useful to them.

Mr. Simpson, in reply, explained that their method of arriving at the percentage of leakage was to fix the 60-light station meter, which was adapted to the supply of the town during the day, as they had very little day consumption; and they took the readings of it, so as to get the quantity of gas coming off the coal. The only way they could get at what was consumed was from the consumers' meters. The leakage was the difference between the gas made and what was consumed. He would not say it was exactly 7 per cent.; but it was as near this as possible, taking the yield of gas at 9000 cubic feet per ton of coal. He used the same class of coal when he got the 9000 cubic feet as when he had only the 6000 cubic feet. He wished he could get his Directors to believe that a station meter was essential in a gas-works. Mr. Masterton had made a very good suggestion as to the syphon valve. It was rack-and-pinion valves that he put in; but if he had known of syphon valves he would certainly have used them.

RETORT-SETTINGS IN RELATION TO CARBONIZING.

Mr. W. Mitchell (Dundee) read a paper on the above subject. He began by remarking that throughout the entire range of apparatus employed in the manufacture of coal gas for illuminating, power, and other purposes, there was no part so important as that used in the distillation and carbonizing department; for there it was that, in a large measure, the gain or loss of the undertaking was determined. It had consequently become proverbial that "the retort-house is the honeycomb of any gas-works." He then went on to say that within the last twenty years, great progress had been made in the erection and construction of retorts and retort-settings of all kinds, both generator and regenerative; and that all the improvements devised had had in view the following three chief aims: (1) Increased production of gas from the coal carbonized; (2) a decrease in the consumption of fuel; and (3) the prolongation of the life of the settings. The experience gained during those years had all tended to prove that, for the advancement of the three aims mentioned, the regenerative setting was the most advantageous in any circumstances; and engineers who had adopted this system of retort-settings, whether in small, medium, or large works, could not have failed to obtain successful and profitable results, if the settings had been properly designed and well constructed, both as regarded materials and workmanship, and if due care and an intelligent interest had been taken in their every-day working. To take the most modest case of only one retort which required to be damped down each night, the benefits of the system were very apparent, as in the morning all that was necessary was to clear away soft ashes, which again left the producer furnace in clear working order, and thus a saving of labour and fuel was effected. If time had permitted, he could have given examples of the benefits to be derived by the adoption of the regenerative system in settings of two up to 11 retorts in a bed; but he intended to take the case of the largest number ever employed—viz., 12. This being the setting in use in the Dundee Gas-Works, he would take as his example the standard Dundee settings as designed by Mr. Yuill.

Drawings showing cross and longitudinal sections of the Dundee setting, on a scale of one-third the full size, were exhibited. Having described the settings, Mr. Mitchell said that the arches were built in two sections—one consisting of 26 ovens placed back to back, thus forming a line of 13 double ovens; and the other of 24 ovens, placed similarly, giving 12 double ovens in a row. These 50 ovens, each of 12 retorts, giving 600 retorts, were contained in a retort-house 300 feet in length and 70 feet wide. It was obvious that this was a large number of retorts for the space occupied, while at the same time there was ample space for working. Those benches were braced with heavy rolled steel girders as buckstaves, all designed and constructed to cope with the expansion and contraction inevitable in a bench of such dimensions. Thereafter the necessary cross girders were erected to support the hydraulic main. The scope of the paper, and the time at his disposal, did not permit of his going into a detailed description of the metal work of the bench; but he might mention in passing—and he would ask the younger members of the Association to bear this in mind—that on the design and construction of that metal work depended the safety of the seal of the hydraulic main, and, indeed, the safety of the entire bench, so that the design of this part of the work was one calling for minute consideration, and careful attention to detail. The retorts were all of Ω-shape, the internal dimensions being 22 in. by 16 in.; while the length over all was 9 ft. 7 in. The thickness of the body was 3 inches; while the mouth was 4½ inches thick for a distance of 14 inches back, and the extra

thickness was all on the outside—thus giving a uniform width and depth inside. The general practice was to have the retorts made with the outside corners to the same circle as the interior, which necessitated the making up of the resulting space with feather-edge bricks. By having the retorts made as shown on the drawing exhibited, and as used in all the Dundee settings, that making-up was rendered unnecessary, thus saving labour and material, and—most important of all—giving a much stronger construction; and it was proved by experience that at the base the square corners tended to prolong the life of the retort, and did not interfere with efficient heating. An exception to this was, however, made with the outside corners of the outside retort on the three upper tiers, which were made circular in the usual way, as it had been found that the curve was desirable at those points to facilitate the passage of the gases round the retorts. All the retorts used had the entire internal surface coated with flint glaze, which helped to greatly reduce the deposit of carbon adhering to them; the glaze also being advantageous in ensuring the retort being gas-tight.

Passing on to deal with carbonization, Mr. Mitchell said the charge of 3 cwt. was allowed four hours in which to become thoroughly worked off; thus giving six charges per day, with a total of 18 cwt. of coal carbonized, which yielded 9000 cubic feet of gas per retort per diem, giving 10,000 cubic feet of gas per ton of coal carbonized, or 108,000 cubic feet per 24 hours per oven. At the end of the four hours, the retorts were emptied by means of the Arrol-Foulis drawing-machines; and the coke fell into an iron hopper running on rails on the stage-floor. The coke not required for fuel was afterwards allowed to fall on to iron shoots, which guided it into iron bogies lying on a 24-inch railway on the ground level. These bogies were then conveyed by locomotives along a railway with a rising gradient of 1 in 35, until a height of 15 feet was attained, at which point the coke was tipped on to cooling-pans fixed to the side piers of the elevated railway, and quenched, while lying on the pans, by means of a hose directed from a platform on the side of the coke gantry, running parallel with the elevated railway, with a space of 25 feet apart. After the coke had been quenched, these pans were tipped by worm-wheel mechanism until it fell on to the yard below, and when an accumulation occurred, the coke was lifted by means of a steam-crane grab, working on the top of the gantry at a height of 17 feet from the ground level. The grab placed the coke in a hopper at the high end of the coke riddles, from which it passed through a series of revolving circular riddles of different mesh. After the various sizes of the coke had been determined by the riddles, it fell into the storage hoppers, whence it was taken as required into carts and bags from shoots in the sides, and into railway waggons from doors in the bottom of the hoppers. The coke used for fuel, however, was put into the producer furnace through the filling-door on the stage-floor level. The advantages of a properly constructed and intelligently worked regenerative setting would be apparent to the members when he told them that the coke sold amounted to 11·7 cwt. per ton of coal carbonized for the past seven months. In direct-fired furnaces of the old type, he had known 75 per cent. of the total coke production to be used as fuel.

In conclusion, Mr. Mitchell said that, while dealing with the regenerative furnace, he might point out the simplicity of the operation of cleaning it in a setting of the kind dealt with. Cleaning every twelve hours was quite sufficient; and during that operation temporary bars were inserted, which rested on the scarcement of the back wall, and at the front were supported by a hanger from the girders of the stage-floor. A steam-nozzle having a 1-16th inch hole, with steam at a pressure of 90 lbs. per square inch playing under the fire-bars, rendered the clinker soft in ash form. An even and uniform heat was obtained in every part of the setting due to the fact that the combustion of the producer gases and the secondary air took place, not in any one part, but throughout the entire setting, and thus the temperature of every part could be raised to a very high point. Apart from the settings, however, it was necessary to have the retort-house suitably arranged for economical working; and a properly constructed chimney was a great help towards success. If there was not the necessary power on the chimney, the settings were placed at a great disadvantage, no matter how efficient they might be. He would just like to mention that it was through the courtesy of Mr. Yuill that he had been enabled to use the drawings shown, and also to give members the figures relative to the setting and its working.

Discussion.

Mr. A. Masterton (Edinburgh) said that, having had experience of all forms of settings, from the direct-fired to the most improved regenerative, he had observed a steady increase in the yield of gas with gaseous firing; and in his opinion the best results were obtained when these settings were worked in conjunction with inclined retorts. He might add that the fuel bill was also decreased with the improvements in the gaseous firing system. He considered it the ideal method of heating retorts. He did not look for many or great advances in that direction. He considered that any advances there might be would be principally in the better utilization and distribution of the heat, and in minor details in the furnaces and settings—probably chiefly in the regenerator, as well as in the saving to be obtained in the reduction of wear and tear. He should like to refer to the vertical retort, which was absorbing a large amount of attention, both in England and on the Continent, and from which good results were anticipated. In the meantime, however, there was not much information available as to carbonizing results, working costs, and the like. But considering the able and experienced engineers who were experimenting with this type of setting, they had every reason to expect good results from their labours. He was glad Mr. Mitchell had referred to the necessity for strong bracing for the retort-bench. From his own experience, he could safely say they could seldom err in putting in the strongest girders and beams, and seeing that they were properly fastened into the shoes—well sunk at the bottom into the concrete, and well braced at the top with strong ties. He had seen buckstaves 8 in. by 6 in. bent almost to a semi-circle.

Mr. H. Rule (Falkirk) was pleased to know that having so large a number of retorts as twelve in a bed was giving the good results stated, as a few years ago the idea would have been considered absurd. The introduction of stoking machinery had, however, done away with these old ideas. He was rather surprised that through retorts had not been adopted, because he considered there was a great quantity of heat at the top ends which could be utilized, and a larger yield of gas obtained. Perhaps Mr. Mitchell would tell them what quantities of cannel and shale were used to obtain 10,000 cubic feet of gas per ton, because a great deal depended upon this. Did Mr. Mitchell think that the grab was more economical than a hot-coke conveyor? It appeared to him (Mr. Rule) that in Dundee the coke was rather severely handled. He thought it would be of advantage to the members if Mr. Mitchell could tell them what area of chimney per mouthpiece he advised, as he was sure this was often not sufficiently gone into in retort-house construction.

Mr. J. D. Keillor (Kirkcaldy) remarked that Mr. Mitchell was familiar with the regenerative settings in Kirkcaldy. They had made alterations in the producers, and they found that they could run from seven to ten days without clinkering. Of course, the quality of the coke would have something to do with this; and Mr. Mitchell might be able to explain it.

Mr. W. Brown (Lasswade) said he often found that retorts went at the bottom corner; and he thought that having them made as shown would prevent this.

The President said he was sure the members would agree with him in saying that the paper they had had the pleasure of listening to had really proved an intellectual treat. It was one which could be read twenty times over, as there was always something likely to be gained from it. What struck him as outstanding in the paper was the evidence it showed, above everything else, of the thorough grip Mr. Mitchell had of the most important process of gas manufacture, and the pains he had taken to put everything before the members in the clearest possible manner by means of beautiful diagrams of the plant. He had impressed upon the younger members of the Association the necessity for great care being taken in the design of the metal work of a retort-house, so as to maintain an equal seal throughout the whole of the hydraulic main. This was of the greatest importance, as they could well imagine serious consequences might result from one end of the hydraulic main being considerably lower than the other, through subsidence, owing to faulty binding. The description of the retort used in the Dundee Gas-Works commended itself to attention, as there could be no doubt that the doing away with feather-edge bricks, by forming the bottom of the retorts as shown in the drawing, tended to make a stronger job; and Mr. Mitchell assured them that it did not interfere with the effective heating of the bench. He should have liked—though he could well imagine that Mr. Mitchell had no desire to make his paper unnecessarily long—if more had been said about the care of regenerative settings. Rough handling of the dampers and secondary-air slides might do a great deal of harm; and it was desirable, wherever possible, to be able to look right through into the main flue, in order to see whether all the furnace gases were being consumed. One other great advantage about this was in seeing whether there were any leaky retorts. When the retorts were being put on, they could, by watching the main flue, tell exactly which retort was leaking, as the gas began to issue from the waste-gas flue immediately the lid was shut. In regenerative settings, a pressure-gauge was a very handy instrument to show the amount of draught, which should be the least possible. An inch of damper was, in many cases, sufficient to produce high heats; and the amount of draw on the settings would be found quite sufficient if the pressure-gauge showed 2-10ths to 3-10ths of vacuum at the flue above the damper. The producer should show a slight back-pressure; and, when charged, the flame should be forced slightly outside the door. The Bunte burette was a very useful instrument to use in connection with this system of firing. With large producers, the fires ought to go for 24 hours without cleaning; and he had seen fires go three days without doing much harm to the heats. This, however, was in the summer time, and would not be justifiable in winter. With regard to the make of gas per mouthpiece, this depended as much upon the heats as upon the class of coal used. For instance, in Dunfermline, with 3 cwt. charges, working 5½ hours, they considered that they did very well if they got 7500 cubic feet per mouthpiece, and 7000 cubic feet with four-hour charges. With coal, however, which gave 10,000 cubic feet per ton, they could very much improve upon these figures; but they just took the most suitable coal lying to hand. One drawback to the setting shown seemed

to be the large number of flues necessary to produce the recuperation of heat. In this there was surely much risk of short-circuiting, seeing that the waste gases had to be kept for so long, and sent through so numerous a series of flues to the main flue. It would seem that, if advantage were fully taken of the waste-gas flue, it should not be necessary to prolong its length, and those of the secondary air flues, much beyond one-half of that shown. As to the amount of fuel used per ton of coal carbonized, it would be quite possible, in places where they supplied coke to cart or waggon direct from the retort, to charge for the weight of water used in quenching, and no fuel per ton of coal carbonized would be used at all.

Mr. MITCHELL, in replying upon the discussion, said the coke-riddles did their work to perfection. He was inclined to be of the same opinion as Mr. Rule, as to coke-conveyors. They had two chimneys, each 150 feet high, with a diameter of 8 feet, from top to bottom. At present, they were only using 1-20th part of cannel. They used to clean the producers every 24 hours. But it depended upon the quantity of ash in the fuel; and they found that, for all the trouble it was, they got a much more regular heat by clearing every 12 hours. He knew the class of coal they used in Kirkcaldy some years ago. They had a coal in which there was scarcely any ash; and so they could easily afford to run for a week. Some coal would produce more ash in 24 hours than that coal would in a week.

The PRESIDENT, in proposing a vote of thanks to the readers of the papers, said that, after having had the description of the retort-settings in Dundee, it would be a pleasure to them to pay a visit to the gas-works there next session; and he was sure they would be made welcome by Mr. Yuill.

Mr. MITCHELL said this was so.

The proceedings then closed.

BRITISH ASSOCIATION OF WATER ENGINEERS.

The Tenth Winter Meeting of the Association was held last Saturday, at the Geological Society's apartments, Burlington House. The PRESIDENT (Mr. P. H. Palmer, M.Inst.C.E., of Hastings) was in the chair, and was supported by a good attendance of members.

The proceedings were opened by the SECRETARY (Mr. Percy Griffith, M.Inst.C.E.) reading the minutes of the annual meeting held at Hastings. They were unanimously confirmed.

TRANSFER.

Mr. John A. M'Pherson, Water Engineer, of Bristol, was transferred from the class of associates to that of members.

PAPERS READ.

The papers presented to the meeting were read and discussed in the following order:—

"The Municipal Ownership of Water Undertakings," by Mr. CHARLES H. PRIESTLEY, M.Inst.C.E., of Cardiff.

"Plumbism due to Electrolysis." By Mr. BALDWIN LATHAM, M.Inst.C.E., of London.

"Notes on Pumping, and Description of Concrete Service Reservoir at the St. Helens Corporation Water-Works." By Mr. J. J. LACKLAND, of St. Helens.

There was considerable discussion on the first two papers; and a shorter one on the third. The papers and discussions will be dealt with in future issues of the "JOURNAL."

Regarding the contribution by Mr. Baldwin Latham, it recorded the events connected with a case of lead poisoning in the district of the South Hants Water Company, which lead-poisoning was traced to electrolytic action upon a lead water-supply pipe through leakage of current from electric lighting wires. It was resolved at the close of the discussion that a copy of the paper, together with the report of the electrical engineers who were consulted in connection with the matter, should be forwarded to the Local Government Board and the Board of Trade. The matter was very properly regarded by the members as being of extreme importance to water suppliers and consumers.

ELECTION OF OFFICE-BEARERS, MEMBERS, AND ASSOCIATES.

The Scrutineers (Messrs. A. R. Cawley and G. O. H. Klopp) reported the result of the ballot for the officers for next year as follows:—

President—Mr. William Millhouse, of Scarborough.

Vice-Presidents—Mr. Christopher Sainty, of Windsor; and Mr. H. E. Stilgoe, of Dover.

Ordinary Members of Council—Mr. George Greenslade, of the South Hants Water Company; Mr. H. Ashton Hill, of the South Staffordshire Water-Works Company; Mr. W. H. Humphreys, of York; Mr. C. E. Jones, of Leyton; Mr. J. J. Lackland, of St. Helens; Mr. William Matthews, of Southampton; Mr. J. S. Pickering, of Cheltenham; Mr. C. C. Smith, of Wakefield; Mr. A. B. E. Blackburn, of Sunderland; and Mr. Thomas Molyneux, of Stockport.

Hon. Secretary and Treasurer—Mr. W. G. Peirce, of Richmond.

The following are the names of members and associates added to the roll:—

Members—Mr. C. Anthony, jun., of East London; Mr. L. L. Baldwin, of Coalville; Mr. S. Hutton, of Exmouth; Mr. J. E. Pickard, of Pontefract.

Associates—Mr. F. B. Pitcairn, of Shanghai, China; Mr. E. G. Ritchie, of Melbourne; Mr. W. F. Bird, of Midsomer Norton; Mr. E. A. Borg, of Margate; Mr. S. F. Corby, of London; Mr. W. J. Dunning, of Colwyn Bay; Mr. T. P. Frank, of Dewsbury; Mr. F. R. Hull, of Rothbury, Northumberland; Mr. George Phelps, of Midsomer Norton; Mr. J. C. L. Verley, of Leeds.

VOTES OF THANKS.

On the motion of the PRESIDENT, seconded by Mr. H. ASHTON HILL, a vote of thanks was passed to the Council of the Geological Society for the use of their rooms.

Proposed by Mr. W. MATTHEWS (Southampton), and seconded by Mr. C. SAINTY (Windsor), thanks were also heartily accorded to the authors of the papers.

All three gentlemen having responded, a similar compliment was paid to the Scrutineers.

PLACE OF NEXT MEETING.

Mr. W. MILLHOUSE (Scarborough) said he could scarcely find words to convey to the members his sense of the great honour they had conferred upon him in electing him to be their President for the ensuing year. He could only say he was very thankful to them for their kindness; and every endeavour on his own part should be exercised to further the interests of the Association. He trusted that the high tone of their transactions would, by the help of the members, be continued during his year of office, which office he hoped to hand unimpaired to his successor. He had great pleasure in conveying to the members, from the Corporation of Scarborough through the Mayor, an invitation to the Council to hold the next summer meeting of the Association at that town. He could assure the members they would have a very hearty welcome; and he hoped that the meeting would be an enjoyable and satisfactory one. He would suggest that about the 11th of July would be a convenient time for the meeting.

A cordial vote of thanks was, on the motion of Mr. C. E. JONES, seconded by Mr. W. G. PEIRCE, passed to the President for his conduct in the chair.

The reply of the PRESIDENT concluded the proceedings.

SOCIETY OF ENGINEERS.

The Fifty-first Annual General Meeting of the Society was held on Monday last week, at the offices, Victoria Street, Westminster—Mr. Nicholas J. West, M.I.Mech.E., the President, in the chair. The result of the election by ballot of the Council and officers for next year was announced. Mr. Maurice Wilson is President, and the Vice-Presidents are Messrs. R. St. George Moore, J. W. Wilson, and W. H. Holttum. Mr. D. Butler Butler is the Hon. Secretary and Treasurer, and Mr. Samuel Wood, F.C.A. (Messrs. Wood, Drew, and Co.), the Hon. Auditor. The President stated that the Rt. Hon. Lord Rayleigh, the President of the Royal Society, and Sir A. R. Binnie, the President of the Institution of Civil Engineers, had been elected by the Council as honorary members of the Society; thus filling the vacancies created by the deaths of Sir Lowthian Bell, Bart., F.R.S., and Mr. James Mansergh. The President announced the premiums awarded by the Council for papers read during the session; among them being the President's Gold Medal to Mr. Sherard Cowper-Coles, for his paper on "The Metallic Preservation and Ornamentation of Iron and Steel Surfaces," and a Society's premium of books to Mr. B. L. Bradley, for his paper on "The Grindleford Stone Quarries and their Working," both of which have been noticed in the "JOURNAL." A vote of thanks was given to the Scrutineers; and the proceedings closed by a vote of thanks to the President, Council, and officers for 1905.

The annual dinner of the Society was held on Wednesday, at the Hotel Cecil—Mr. N. J. West, the retiring President, in the chair. Among those present were Sir Alexander Kennedy, F.R.S., Mr. John Gavey, C.B., the President of the Institution of Electrical Engineers, Mr. W. Frecheville, the President of the Institution of Mining and Metallurgy, Mr. Percy Griffith, the Secretary of the British Association of Water-Works Engineers, Mr. Maurice Wilson, the President-Elect, and Mr. Perry F. Nursey, the Secretary.

The preliminary list of awards in connection with the recent Exhibition of Smoke Abatement Appliances, a report of which appears elsewhere, shows that the judges have given a silver medal to the Gaslight and Coke Company, for their gas-cooking apparatus; to Meldrum Bros., for their refuse destructor; and to the Power-Gas Corporation, for their exhibit of Mond gas plant. Bronze medals have been awarded as follows: Cannon Iron Foundries, for (1) prepayment gas-meter, (2) gas-cooking apparatus, (3) domestic washing-boiler, and (4) gas and air regulator; Crossley Bros., for suction gas-plant; Davis Gas-Stove Company, for gas-cookers with automatic gas-tap with bye-pass; Eagle Range Company, for indicating damper and automatic draught regulator; Imperial Stove Company, for (1) stove with removable enclosure, (2) gas-cooking stoves; Parkinson and W. & B. Cowan, for (1) gas-cookers, and (2) prepayment gas-meter; Thos. Potterton, for gas-heated hot-water system; Richmond Gas Stove and Meter Company, for (1) gas-cookers with fire-brick radiators for grilling, and (2) "Ilford" gas-fire; Sanders, Rehders, and Co., for "Automatic" CO_2 recorder; William Sugg and Co., for gas-cookers; and Wilsons and Mathiesons, for internal circulating water-heater.

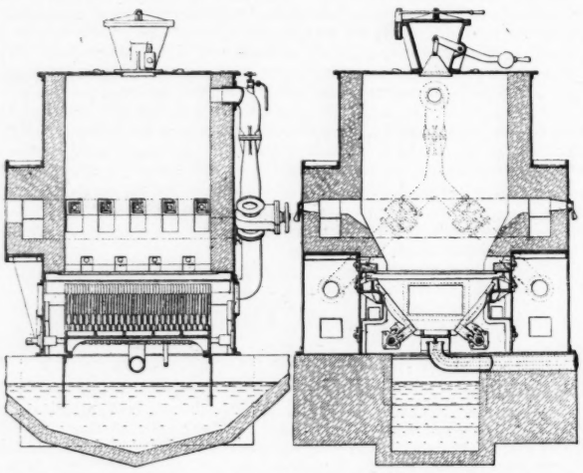
REGISTER OF PATENTS.

Gas-Producers.—Hall-Brown, E., of Glasgow. No. 27,571; Dec. 17, 1904.

This invention relates to producers in which bituminous coal is used, and in which the unfixed hydrocarbon gases collected in the upper part are led downwards and made to pass through the hotter regions of the fuel bed, so that they may become fixed.

Difficulties have arisen with this form of producer, says the patentee, in that, on the one hand, the tarry matter contained in the volatile gases has clogged the fuel or ashes into a tarry mass about the point of their re-entry into the producer—thus seriously obstructing their passage and preventing their proper fixation; and, on the other hand, there has always been the possibility of these unfixed gases (instead of passing through the hot-fuel bed) forming a cool passage through the fuel and reaching the main fixed-gas outlet unchanged, thus contaminating the fixed gas with tarry matter.

A producer made (as shown) according to this invention is preferably rectangular; and the fire-grate, when used, is preferably sloped upwards from the centre to the sides. Mechanically operated fire-bars or a chain grate may be employed to prevent clogging and assist in



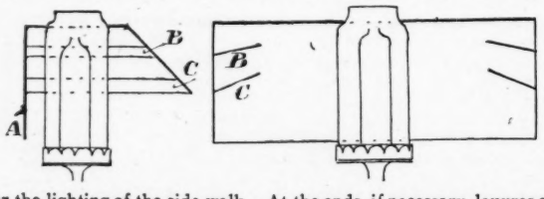
the descent of the ashes. The producer is also provided with the usual charging devices and means for supplying air, or air and steam, to support combustion.

The volatile hydrocarbon gases are drawn off from the upper portion of the producer, and pass to a casing at or about the grate level, or level of combustion. From this casing, a series of passages lead the gases back into the producer; the passages being arranged at various levels so that the gases may be admitted either at the level of (or above, or below) the grate, according to which position is found most suitable in practice for the particular class of fuel used—means being provided for closing the passages not being used at any particular time. Chambers are formed in the side walls of the producer communicating by passages with its interior at a level suitable for the final discharge of the fixed gases, or at different levels, so that the gases may escape at the height found most suitable. A number both of the passages for ingress of the unfixed, and egress of the fixed, gases are provided, so that strong local action is prevented; and the unfixed gases enter, and the fixed gases leave, the fuel bed practically equally throughout and in all directions.

The producer may be used as a "pressure" or a "suction" plant. In the former case, only one suction pipe is required for the upper part; but when used as a "suction" producer, two or more outlets are provided for the unfixed gases, so as to ensure at all points of the upper part of the bed a greater vacuum or suction than at the outlet for the finished gas, and thus prevent any of the unfixed and tarry gases from the upper part of the fuel bed escaping at the finished-gas outlet. When used as a "suction" producer, an automatic device, actuated by the vacuum at the outlet for the finished gas, may be used to regulate the amount of steam passing to the ejectors, which draw off the unfixed gases from the upper part of the fuel bed, or other suitable means may be provided to ensure that the vacuum in the outlet for the finished gas and at the outlet or outlets for the unfixed gases may bear a suitable ratio to each other.

Reflectors for Street-Lamps.—Lord, W. T., of Grosvenor Square, W. No. 28,713; Dec. 29, 1904.

The reflector shown is suitable for street lighting; the side A being deepened to reflect light across the road, but allowing sufficient to pass

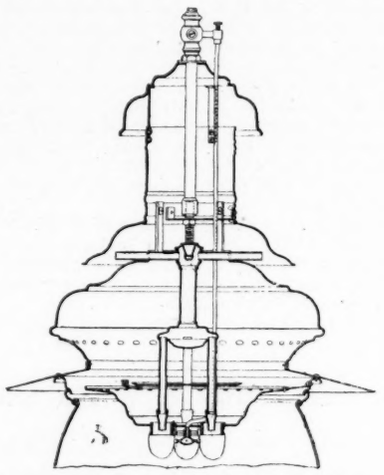


or the lighting of the side-walk. At the ends, if necessary, louvres are fixed at suitable angles (as B and C), which, with the elongated shape of the reflector, of any suitable curve or section, assist in reflecting the light lengthways of the street. In some cases, two or more end pieces—fitted, if required, with louvres—can surround a light. The louvres vary in section to better direct the rays. They are of metal, glass, or other suitable material, and open or enclosed in transparent cases of any shape.

Inverted Incandescent Gas-Lamps.—Altman, J., of Commercial Road, E. No. 28,796; Dec. 29, 1904.

This application for a patent has for its object to form a lamp of large size—adapted for street lighting, for the illumination of large buildings, and so forth.

The working parts of the lamp operate substantially on the principle used in the lamps described in patents Nos. 10,552 and 14,976 of 1904, although the parts are specially adapted for the particular purpose now



in view. In this case, the lamp has a number of hanging incandescent mantles—say, three, four, or five. The gas is led into a fitting of the usual type wherein the gas passes through fine orifices, while air-pipes communicating with the outer air enter the fitting adjacent to the orifices—thus securing a mixture of gas and air as in the usual bunsen burner. Below the fitting last described is a mixing-chamber, from which extend tubes, each leading to one of the hanging mantles. The apparatus is enclosed in a casing preferably having a long chimney portion, so as to secure a good draught of air. Below the chimney is a dome-shaped part formed with overlapping "eaves," beneath which is an inwardly curved portion. Below the latter the casing again spreads outward into a larger dome or dish, with overlapping "eaves" as in the first instance, and again having an underpart curved inward. In this latter portion is supported a plate having curved edges and in which are a series of holes, one corresponding with each of the hanging mantles. The burner-tubes before-mentioned pass into these holes, and the mantles are supported therein by fittings of incombustible material, and adapted to be inserted from below. Each of these fittings has two sets of projections—one above the other. The projections of the upper set are adapted to pass through corresponding slots formed in the plate and, when turned, to lie over portions of the plate until they are stopped against suitable abutments. The lower projections serve for holding the fittings by hand and manipulating them during the insertion and removal of mantles.

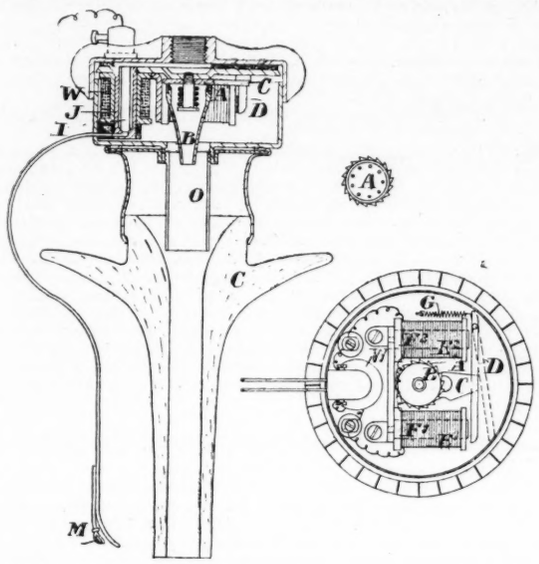
Gas Igniting and Extinguishing Apparatus.—Down, H. L., of Cannon Street, E.C., and Wiseman, D. H., of Old Broad Street, E.C. No. 29,345; Dec. 31, 1904.

The apparatus is intended for igniting and extinguishing the gas in inverted incandescent burners, with the object of providing against the risk of back-firing, and so that the igniting apparatus shall not be exposed to the heat of the flame. As will be seen, the apparatus is an adaptation of the "Telephos" device.

The apparatus (p. 835) consists of an upper half, to which is attached the mechanism, and the lower half carrying the inverted burner. A is a rotary valve, in which are nine evenly-spaced perforations corresponding to similar perforations of the same spacing and pitch-circle in the valve seating, formed by a raised boss in the centre of the base-plate. There being eighteen teeth in A and nine perforations, it will be necessary to move the valve two teeth round in order to bring the perforations from one position of coincidence to the next. If only half this movement is given—*i.e.*, one tooth—the perforations in the valve will remain half-way between those in the seat, and the valve will be closed. The valve is fastened to the base-plate by a pin, and is kept up against its seat by a spring. B is a nipple screwed into A. It points downwards through the continuation-piece O into the burner-pipe. A is actuated by the pawl C, which is attached to the pivoted armature D. F^1 F^2 are the soft-iron cores of the coils E^1 E^2. G is a spring arranged to keep the armature D in its normal position.

The above are the usual parts of the mechanism of the Telephos device for regulating the main gas supply. For controlling the ignition, in this instance a solenoid valve is employed. The gas is allowed to pass from the main supply pipe along a channel of an asbestos washer, and thence into the small valve-chamber. J is a hollow brass spindle screwed into the base-plateh, te hollow centre forming the valve-chamber. On J is threaded the bobbin carrying the coil W; and in the valve-chamber is placed the small soft-iron valve I. This valve has a seat formed for it in the lower end of J. Outside this lower end of J a washer, made of any suitable non-conducting material (such as vulcanized fibre), is screwed on. Two holes are drilled

through it into the hollow centre of the spindle immediately below the valve-seating; and into these holes are inserted two tubes, which are prevented from making an electrical contact with J by screw terminals.



The tubes serve the double purpose of conveying the gas to the pilot-light and of conducting the current to and from the igniter M. They are brought down well clear of the burner and bent at the ends, so as to direct their jets upon the main stream issuing from the burner-nozzle. The igniter is placed near the ends of the tubes, one of which is pierced so as to form a downward climbing-light for igniting the jets issuing from their tips. Thus the pilot-light playing upon the main jet effects ignition at the burner proper.

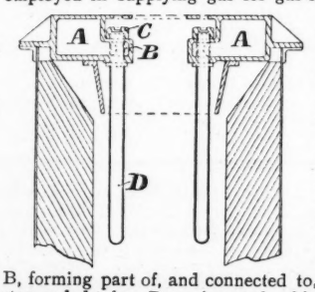
Assuming the valve A is in the shut position, then on passing a current through the coils, the cores will become magnetized and attract the armature D, thus causing the pawl C to open the valve. The gas passes through into the nipple B, which, being tapered towards its lower end, passes the gas out at a slightly increased velocity. It is at this point that the supply of air needed for the proper combustion at the mantle is introduced. The stream of gas issuing from the nozzle of B induces a current of air along with it into the guiding piece O; and whence the mixture will pass direct through the burner-tube into the mantle. Simultaneously with this operation another will take place. On the current passing through the solenoid coil W, the valve I will be sucked up off its seat, thus opening the way for the gas to pass in the valve-chamber. The platinum of the igniter M will also be made to glow by the same current, and the small streams of gas issuing from the perforations in one of the tubes already referred to will impinge on the glowing platinum, be fired, the pilot-light will be ignited, and also in turn the main jet.

Change-Giving Mechanism particularly Applicable to Prepayment Gas-Meters.—Rotherham, K. and Johnson, W., of Coventry. No. 244; Jan. 5, 1905.

In one construction of this appliance—as applied to mechanism for giving change in pennies for a threepenny piece, a sixpenny piece, or a shilling, attached to a prepayment gas-meter—each penny, when put into the apparatus, turns a star-wheel or the like, one tooth, so as to feed forward a series of boxes, bringing one box underneath a shoot, down which the penny drops. Preferably the penny is dropped into a carrier moved longitudinally from its normal position to one above the shoot, in which position the penny is released from the carrier and falls into one of the boxes mentioned. The carrier is then withdrawn into a position ready to receive another penny, when more gas is required. As the penny, and not the carrier, actuates the star-wheel, the latter is not turned backwards when the carrier is withdrawn.

Gas-Producing Plants.—Grice, H. J., of Acocks Green, near Birmingham. No. 1843; Jan. 31, 1905.

This invention relates to producers generating their own steam, and employed in supplying gas for gas-engines or other purposes. The object of the inventor is "the quick and reliable method of making steam by the heat generated in the body of a producer by its own fuel;" and he purposes using it inconjunction with the producer plant described in patent No. 16,067 of 1904.

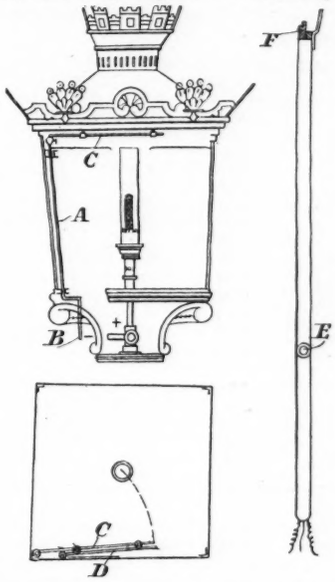


On the top of the generator is fitted a hollow metal casing A, preferably of cast iron, which forms the steam-boiler. Projecting from the inside of the casing shown are pockets B, forming part of, and connected to, the body. Into these pockets stop-ended tubes D are inserted, which go down into the body of the fuel. They are drilled in the passage B to receive the water from the body. It will be seen that these tubes—going into the hot fuel—make steam very quickly; and, being straight, they do not interfere with the proper working of the generator. The tubes are secured by a screwed cap C, which can be tightened or loosed by a spanner from the outside, enabling fresh tubes to be inserted without taking apart the body. The tubes may be extended to the outside of the steam-boiler, and as far down into the fuel as is desired for their proper working.

Lighting Gas-Lamps by Electricity.—Thompson, W. P.; a communication from Oscar Freudenthal, of Laeken-Brussels. No. 7814; April 12, 1905.

This invention has for its object the lighting of ordinary incandescent gas-jets by a high-voltage electric spark produced above the jet at the moment of opening the tap by means of a special rod provided with wires starting from a battery of cells or accumulators contained in a satchel carried by the lamplighter. The pole at the moment of opening the tap is brought into contact with conducting rods arranged in the interior of the lamp, so that the current passing in the rods causes the formation of sparks above the burner, and so produces the ignition of the gas.

In the form of construction shown, along the wall of the interior of the lamp a conducting rod A is mounted, supported by hinges, on which it may freely turn, and terminated at its lower part by a double elbow forming a crank B placed near the gas-tap. The end of the rod may even be connected with the gas-tap, so as to be directly operated by it.



The upper part of the rod ends in a sleeve on which a horizontal rod C fits, which rod projects into the interior of the lamp, and is terminated by a hook above the burner. Beside this rod, and held against it by means of insulators, another rod D is arranged, the end of which is also hooked, and almost comes in contact with the end of the rod C. The two ends of the two rods thus form the two poles intended to produce the spark. The rod D is provided towards its centre with a spring (fixed to the lamp), which tends to bring it against the wall of the latter.

This internal arrangement is actuated by the lamplighter's pole so as to effect—in consequence of a manipulation of this latter—a rotary movement, which brings above the jet the electric spark produced at the ends of the rods at the actual moment of the contact of the pole with the gas-tap. The arrangement resumes its normal position by the pull of the spring as soon as the pole is withdrawn.

Wires, starting from a battery carried by the lamplighter, and ending at a contact button, from which the conducting wires run which reach to the end of the lamplighter's pole E, are inserted in the latter. This pole is terminated by two metallic pieces intended, the one for opening the tap of the lamp, and the other for operating the end B of the conductor A, governing the latter, and forming a contact with the end.

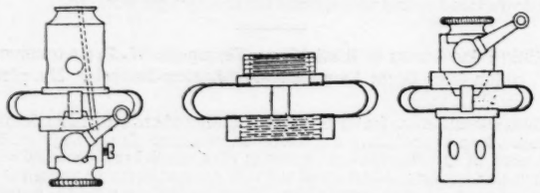
The working of the arrangement is as follows: The lamplighter carries the electric battery (say) in a satchel, and connects the wires of his pole with the battery. In order to light a lamp, he presses on the button E of his pole, and, opening the gas-tap, and imparting a small rotary movement to the pole, he makes contact by means of the piece F with the end B of the conductor A. The spark is thus immediately produced at the ends of the two conducting rods, and, by the rotary movement given to the pole, the conductor pivots on itself and leads the spark towards the centre of the lamp above the burner. Having lighted the lamp, the lamplighter withdraws his pole, and the arrangement resumes its normal position by the action of the spring.

Anti-Vibration Device for Incandescent Gas-Burners.—Harris, W. P., of Herne Hill, S.E., Balcarras, R. K., of Highbury, N., and Hemmings, J. F., of St. Leonards-on-Sea. No. 10,307; May 16, 1905.

This invention consists of a device for interposition between the mixing-chamber of an incandescent gas-burner and the perforated nozzle through which gas passes from the gas-fitting into the chamber; the object being to absorb all shocks and jarring vibrations.

The device consists (see p. 836) of a spring connection adapted for engagement at the fitting-part with the nozzle and at the receiving-part with the mixing-chamber—the positions of the fitting and of the

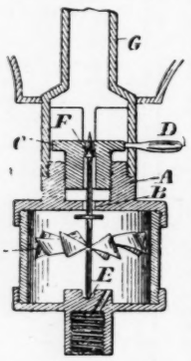
receiving parts relatively to each other being such that when the device is in use air is free to pass between them and enter the mixing-chamber with the stream of gas passing into it from the nozzle.



The fitting-part consists of a screwed ring or collar adapted to be engaged with the ordinary screw-thread around the gas-nozzle of the burner, and the receiving-part consists of a support for the other parts of the burner and the retention of it in the required position relatively to the nozzle, through the medium of springs carried by the fitting-part; shocks and jarring vibrations received by the fitting-part are absorbed by the springs to such an extent as to prevent injurious action on the mantle of the burner.

Gas-Burners.—Lake, H. H.; a communication from B. F. Jackson, of Boston, U.S.A. No. 11,323; May 30, 1905.

This invention relates particularly to that class of gas-burners in which a mixture of gas and air is designed to be consumed. One object of the invention is to maintain a clear passage for the gas to the air-chamber. Another object is to so construct a burner of this nature that the gas, in its passage to the air-chamber, may be directed towards the axis of the chamber. A third object is to so construct a burner of this nature that the flow of gas to the air-chamber may be controlled without reducing the pressure.



Gas-burners of this general nature, the patentee points out, usually comprise an air-chamber having openings for the admission of air; and gas, under pressure, being supplied to the chamber, it is designed to draw in, through the openings, a proportionate amount of air, and to mix with the air prior to combustion. But much difficulty has been experienced in combining the air and gas in suitable proportions to secure approximately perfect combustion in burners furnished with mantles adapted to become incandescent, and "it has been found desirable to supply the gas through minute orifices, which soon become clogged by impurities in the gas."

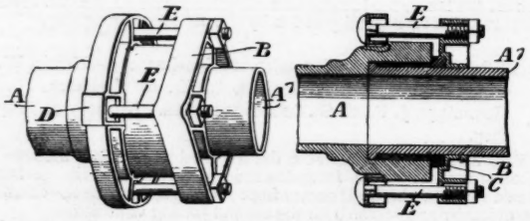
To obviate this trouble, the suggestion is to construct a gas-chamber, preferably as shown, having the top furnished with an exterior screw-threaded collar A, having an interiorly screw-threaded socket communicating with the interior of the chamber by the channel B. In the socket is screwed the threaded controller C, having its upper channel contracted. This controller is designed to be rotated (preferably by the lever D) to move lengthwise, owing to the pitch of the screw. The bottom of the chamber has a screw-threaded socket communicating, by means of an inclined channel, with the interior of the chamber.

Rotatably mounted in the bearing E is one end of a shaft, the other end of which is reduced in diameter to form a pointed clearer, which extends into the contracted portion of the channel F, and preferably through the channel, whereby an annular channel, gradually contracting in diameter towards the upper end, is formed round the contracted portion of the shaft. Fixed on the shaft is a series of fan-blades, so inclined to the direction of the inlet channel that gas entering the chamber through it will act on the blades to effect the rotation of the shaft. The collar A is adapted to receive and support the air and gas mixing-chamber G (of any well-known construction), having inlets through which atmospheric air may be drawn into the chamber by the suction of the entering gas.

Stopping Leaky Pipe Joints.—Dresser, S. R., of Bradford, Penn., U.S.A. No. 14,693; July 17, 1905.

This invention relates to clamps for stopping leaking bell-and-spigot joints without interfering with the joint or interrupting the flow of fluid through them; and it is an improvement upon the constructions described in patents Nos. 1996 and 1998 of 1900.

A represents the bell, and A^1 the spigot of a bell-and-spigot joint to be sealed with lead or other suitable material. B represents the main clamping ring, which is preferably made substantially square with a circular aperture to fit around the spigot portion A^1. It is divided diagonally into two sections, having overlapping end portions provided



with registering bolt holes of oval shape. The overlapping portions of each section are also provided with interlocking studs and apertures to enable the parts to hold their position upon the spigot until the bolts can be inserted. The ring or plate B is also provided on the side adjacent to the central aperture with a packing recess. In order to make the ring B as light as possible and yet insure the desired strength, it has on the side opposite the packing recess an annular reinforcing flange, and adjacent to its outer edge a reinforcing flange. Each section of the ring is also provided adjacent to the angular portion of the outer flange with a Y-shaped reinforcing web connecting the annular flange with the outer flange, as shown, and forming a diamond or lozenge shaped recess.

C is the packing-ring, preferably formed of rubber and cut diagonally at some point so that it can be arranged around the spigot A^1 and placed within the packing recess. D is the secondary or bell-engaging ring, also made in two parts, with overlapping ends containing registering bolt holes. The ring is preferably circular in form; and each section is provided at one end with lateral flanges, between which the opposite end of the other section lies when the parts are in position. This ring, when placed round the bell A as shown, causes the shoulder of the bell to be engaged by the projections and inner flanges provided.

The bolts E connect the clamping rings B and D, passing through oval-shaped holes in the ring D, which fit oval shoulders beneath the heads of the bolts and prevent them turning. The packing ring C is wide enough to cover the lead or cement seal, and extends from the spigot over the mouth of the bell A; and when the nuts on the bolts are screwed up, the packing ring is compressed firmly into contact with the bell mouth, the lead seal, and the spigot A^1—thus preventing any leakage from the joint.

Coupling for Spigot and Socket Pipes.—Dresser, S. R., of Bradford, Penn., U.S.A. No. 14,694; July 17, 1905.

This—the second of a series of four patents taken out at the same time—relates to couplings for spigot and socket-pipes in which the end of the socket is enlarged to receive a packing ring, and in which packing rings are employed having a V-shaped groove, engaged by a correspondingly shaped sleeve; the parts being drawn together by clamping rings and bolts and nuts, somewhat in the same way as illustrated above—No. 14,693.

The socket ends of the pipes are here made with two successive bells or sockets, both of which are parallel with the periphery of the spigot ends of the pipes; the V-shaped sleeve being formed on the clamping fitting over the spigot end of the pipe section. The opposite clamping ring is formed on its interior with a number of projecting ribs or studs, which directly press upon the exterior of the bell.

Stopping Leakage of Collar-Pipe Couplings.—Dresser, S. R., of Bradford, Penn., U.S.A. No. 14,695; July 17, 1905.

This invention relates to the device for stopping leaky pipe-joints described in patent No. 1998 of 1900, which device was constructed with the object of being quickly and conveniently applied to a leaking screw collar or connection in a pipe line, without interfering with the screw collar or stopping the flow of fluid through the line.

The device comprises two clamping rings—of much the same construction as in patents Nos. 14,693 and 14,694, described above—made in two or more sections, so that they can be placed around the pipe sections on each side of the screw collar which is leaking; each of the rings having a packing-recess to receive a ring of rubber or other packing, and bolts connecting the clamping rings whereby they may be drawn together to compress the packing against the ends of the screw collar and thus stop the leak. On the ring sections are provided interlocking pins and apertures, so that the ring sections may be placed around the pipe and interlocked, so as to enable them to support themselves upon the pipe until the packing is in place and the bolts are inserted. This last-mentioned construction is said to greatly facilitate the placing of the rings in position, especially in the case of rings of great size and weight.

APPLICATIONS FOR LETTERS PATENT.

25,112.—Welch, W. H. I., "Incandescent gas-lamps." Dec. 4.
25,183.—Smith, A., "Gas-fittings." Dec. 5.
25,186.—Brecknell, H., "Automatic gas cut-off." Dec. 5.
25,218.—Rigby, C. T., "Gas-fittings." Dec. 5.
25,270.—Glendinning, W. M., "Gas-geysers." Dec. 5.
25,275.—Wilton, G., "Manufacture of gas." Dec. 5.
25,313.—Atkinson, C. J., "Suction-gas producers." Dec. 6.
25,329.—Hamilton, R., "Water-spraying for gas-retorts." Dec. 6.
25,358.—Price, H. A., and Turner, H. C., "Gas-stoves." Dec. 6.
25,419.—Cleland, J., and Stewart, J. C., "Pressure-regulators." Dec. 7.
25,466.—Schatz, E., "Analyzing gas." Dec 7.
25,557.—Joly, C., and Boucher, R., "Lighting and heating." Dec. 8.
25,573.—Hawker, A B., "Automatic gas cut-off." Dec. 8.
25,574.—Simpson, W. S., "Desulphurization of coke." Dec. 8.
25,587.—Gibson, R. E., "Charging retorts. Dec. 8.
25,596.—Lake, H. H., "Mixing gas and air." A communication from Selas G. m. b. H. Dec. 8.
25,642.—Beaton, D. M'G., "Mantle supports." Dec. 9.
25,663.—Lake, H. H., "Mixing gas and air." A communication from Selas G. m. b. H. Dec. 9.
25,665.—Elsenhans, A., "Purifying gases." Dec. 9.

Gas Suffocation Case at Sedgley.—On arriving at his home at Sedgley last Wednesday week, Mr. Bowyer, a clerk, found all the doors of the house locked; and on gaining entrance through a window, he was horrified to discover his wife and child, a girl of 14 months, on the bed unconscious—the latter being quite dead. There was a strong smell of gas; and he observed that the bracket in the room was detached from the supply-pipe, it having apparently been wrenched off. It is stated that Mrs. Bowyer only six weeks ago left a lunatic asylum, and that before her incarceration there she had made several attempts to destroy herself.

CORRESPONDENCE.

[We are not responsible for the opinions expressed by Correspondents.]

The New Gas-Testing Burner.

SIR,—The 5-feet rate has come to stay; and it would be as profitable to expend our energy in tilting at windmills as in endeavouring to obtain a reversion to the method for which this Company were the first to obtain an Act of Parliament, and afterwards spent much time and money in endeavouring to maintain.

To consume gas at a fixed rate may be unscientific, irrational, and uncommercial. Unfortunately, a very competent tribunal thought otherwise; and Parliament accepted their recommendation, with the proviso that the burner used should be capable of regulation—which, after all, is the same thing that Mr. Grafton found necessary with his gas-furnace, and Messrs. Townson and Mercer with their "bunsen."

The new burner is suitable for gas up to nearly 20-candle power. If 16-candle gas is consumed in it, less air is given, with 14-candle less still, and so on. I have not tried it with 60-candle quality. It has been constructed as the result of experience gained by a careful scientific investigation into the causes affecting the luminosity of argand flames, and I do not think that those who use it will be disappointed with their results.

CHARLES CARPENTER.

South Metropolitan Gas Company,
Dec. 16, 1905.

Price of Gas to Possible Users of Suction-Gas Plant.

SIR,—The letter from Mr. R. Hall on the above subject, published in the last issue of the "JOURNAL," appears to me to deal very inadequately with the point which Mr. Newbigging makes so clear in his paper.

The illustration he gives does not in any way dispute the contention which Mr. Newbigging holds—viz., that it is commercial suicide to sell gas at a less price than it costs to produce. If Mr. Hall will take the trouble to refer to the "Gas World Year Book" for 1905, he will find that in every single case, with but one exception, the cost of producing 1000 cubic feet of gas exceeds 1s. 6d. This figure is arrived at by adding the capital charges to the net cost of gas. How then is it possible to sell gas at 1s. 6d. (in some cases less) per 1000 cubic feet, and still maintain a healthy balance-sheet? Such a transaction—from whatever point of view one likes to look at it—can scarcely be considered profitable.

The business of an ordinary commercial house bears little analogy to that of a gas undertaking. There is a certain amount of elasticity allowed in the one case which is impossible in the conduct of gas concerns, whether private or municipal. No business house would, however, consent to supply a customer which involved a loss on every transaction; and yet this is what is proposed to be done by many of the gas authorities who are granting such absurd preferential rates to power-gas consumers.

If suction gas can be made at the price claimed for it, and even if it cannot, it will make headway, because customers can always be found to take up novelties; and to attempt to secure the whole of the power business for coal gas producers by any artificial manipulation of the price, is certain to fail, and will moreover bring discredit on the concern by reason of the dissatisfaction of the other classes of consumers.

G. WILLIAM TODLEY.

Rochdale Road Gas-Works, Manchester,
Dec. 15, 1905.

Laying Gas-Pipes Under Footways.

SIR,—Replying to Mr. George Helps's letter of inquiry in your last issue, if he is satisfied, as he appears to be, that "a map, plan, or drawing may reasonably be required when it is proposed to lay a main pipe several inches in diameter," it seems to me that it must also be equally reasonable to require one when a long length of smaller main-pipe is proposed to be laid.

Possibly he has overlooked the fact that in places where the Towns Improvement Clauses Act, 1847, is in operation, section 13 prescribes that the Commissioners are to prepare a plan of their district, upon which is to be marked the course of sewers, water, and gas pipes, &c., within their district. This, taken in conjunction with the sections of the Gas-Works Clauses Act, 1847, may therefore account for the Local Authority of Nuneaton persisting in their request for a plan of the pipe-laying referred to.

In any case, I think he will agree that it is hardly worth while opposing the wishes of the governing authority over such an insignificant point of procedure, to the detriment of the amicable relations which should and may exist between his Company and the Local Authority.

G. T.

Dec. 16, 1905.

The Salaries Question.

SIR,—Permit me to enter a strong protest, on behalf of the junior members of the gas industry, against the terms of the advertisement of the Stockport Corporation for an Assistant-Engineer to their gas undertaking, as advertised in your current issue; and I trust that you, Sir, will also give us your support in this matter.

The commencing salary of £120 per annum—a shade under 46s. 2d. per week—can only be described as ridiculously inadequate remuneration for a man supposed to be competent to fill such an appointment on a works making some 600 millions per annum. Such a pittance is totally inadequate for a man who has studied so highly specialized a branch of mechanical and thermo-chemical engineering.

The bait of possible increases to an ultimate maximum of £200 per annum, "at the discretion of the Council," is not encouraging, and can be taken for what it is worth in view of the treatment they meted out to their present Chief Engineer a few years ago on a similar matter. In any case, such a body would be most unlikely to give more than £10 increments, and that not every year. So that it would take somewhere about ten years to arrive at the maximum under the most favourable circumstances.

The successful applicant will no doubt be required to have a sound knowledge of mathematics, applied mechanics, mechanical engineering, building construction, civil engineering, drawing, and chemistry applicable to the business and to the materials used in construction. Further, he will be expected to have had some years' experience in the gas industry, able to control men, and have some business and administrative ability. All this is not easily or quickly acquired; and in return the munificent remuneration of 46s. per week is all that is offered. This cannot be considered a living wage for the position. Truly—as Mr. Sutcliffe remarked in his recent address to the Yorkshire Juniors—the game is not worth the candle. Many general and carbonizing foremen are better treated.

The senior members are equally badly off, as witness the recent incidents of Margate and Todmorden. The Todmorden Council lately offered £100 a year less than was offered when the post was vacant some ten years ago; and it is to be presumed that neither the make nor the business has decreased in the same ratio as the salary in that period—neither is the cost of living less by one-third. If this continual depreciation of salaries below a living wage goes on, the gas industry, like the Army, will only be a possible career for men of private means—otherwise a navvy, without appearances to keep up, will be better off.

It is no doubt difficult to discover a remedy for this result of the gas undertakings of the country getting into hands of municipal traders; but it is quite time something was done. In view of the organization now existing among Senior and Junior Associations, surely some combination could be arrived at for their mutual benefit, whereby a minimum salary could be agreed on the basis of the make—*i.e.*, a fixed sum per million per annum, decreasing proportionately as the make increased, so that managers of large and small works are equally fairly treated. The minimum salary of assistants to be one-third of the minimum of the engineer. Efforts should be made to bring in all those outside the fold; and any member accepting less than the minimum should be severely dealt with.

This savours of Unionism, of which I am no great friend. But I am aware of no other scheme which will check the "rot." I am personally willing to take a leading and active part in any scheme to amend this lamentable state of affairs; but judging from the enthusiasm and energy with which most schemes for the benefit of the members of the gas industry are taken up, I must confess I am not very optimistic of success.

I regret that it is necessary to adopt a *nom de plume;* but I am not anxious to further incur the persecution of our taskmasters in my attempt to impress on them that, as "the labourer is worthy of his hire," so is also

THE PROFESSIONAL MAN.

Dec. 16, 1905.

LEGAL INTELLIGENCE.

HIGH COURT OF JUSTICE—CHANCERY DIVISION.

(Before Mr. Justice BUCKLEY.)

Wednesday, Dec. 13.

New Inverted Incandescent Gas-Lamp Company v. Cope and Timmins, Limited.

On the hearing being resumed of this case to-day,

Mr. *James Swinburne* was further cross-examined and afterwards re-examined. He stated that defendants' lamp did not contain a deflecting cone as described in Bernt and Cervenka's specification.

Mr. *Geo. C. Marks*, of the firm of Messrs. Marks and Clerk, patent agents, proved the making of various experiments with the burner in question. There was no difference in the temperature of the mixing-chamber, whether or not the metal hood was on. The same applied to the tube; the temperature gradually lessened as one got farther from the flame. The temperature of the plaintiffs' burner, where the air and gas entered, was lower than that of the defendants. He also proved various photographs. An ordinary "C" burner, when it was inverted, would light-back at the nipple but for the flash-back plate. He had tried it. One set of three photographs showed an ordinary "C" burner, inverted, which burned for three hours continuously; the photographs being taken at 2.30, 3.30, and 5.30 p.m. On the 4th of December, another photograph showed side by side two of plaintiffs' burners—one with an ordinary mantle, and the other with one of the shape they were now using, fitting the flame. A number of other photographs were identified, showing the results obtained with a double tube, and with different hoods and caps. He had made hundreds of experiments with ordinary bunsen burners, inverted; and in most cases he had to reduce the orifice in the nipple to make them burn satisfactorily. There was no direction to this effect in the plaintiffs' specification. He had brazed a piece of metal on to the shank of the tube of an ordinary inverted bunsen burner, with a mantle, and though the tube was red hot, it did not affect the luminosity of the mantle. The flame remained blue, and did not light-back. He tested the same burner under exactly similar conditions, but with the tube cold, and the candle power was the same. He also fitted up a Schodt burner, inverted, with a mantle, and it gave a light of 22 candles. He had also fitted a burner with 5-16th inch space between the nipple and the top of the tube, and no mixing-chamber, and it gave 20-candle power. There was also a space of ⅛ inch between the top of the mantle and the lower end of the tube. Witness then narrated the result of experiments with the plaintiffs' burner and different-shaped mantles. With the shape shown in the specification, it made no difference whether or not the head of the burner entered the mantle; but

with the new-shaped mantle, as now sold, it made a great difference. The important factor in inverted incandescent gas lighting was the regulation of the supply of gas, and having a mantle which fitted the flame. Special bunsen burners were manufactured for use in fume cupboards; and they were frequently made of porcelain. He produced one of this kind, which burned very well when inverted, and it worked satisfactorily with a mantle.

Cross-examined: He had not tried inverted bunsen burners before Bernt and Cervenka's patent came out, as he was not asked to do so. Witness was cross-examined in detail as to the results of using an ordinary "C" burner upside down; and he said he did not test for candle power. He should say it was more than a mere fraction of the light given in the upright position; but it was certainly less. It was not a practical burner in that form. He admitted that the experimental lamp without a mixing-chamber, and with a space between the mantle and the tube, was not a commercial success. It was a very rough experiment, only made to show that incandescence could be obtained under such conditions. Witness's cross-examination was continued at some length, but nothing was elicited to qualify his evidence-in-chief, except with regard to his statement that he found the temperature at the upper part of defendants' burner the same, whether or not there was a deflector. It appeared that he took the temperatures by melting points of metals, alloys, and in the special case referred to he could only state that it was between 237° and 467° Fahr.; so that he could not say that the temperatures were actually identical.

After the midday interval a small gasholder was brought into court, and a few of Mr. Marks's experiments were repeated with somewhat different results; the inverted "C" burner, for instance, after burning some minutes, showing a more or less luminous flame.

In further cross-examination, witness did not admit that this flame was properly described as a luminous one, though there were luminous patches in it. He also said that the pressure—1·6 inches—was lower than any with which he had experimented.

The pressure was then increased to 2·5 inches; but little, if any, change was produced.

Re-examined: His experiments extended over many months; but he never found the pressure as low as 1·6 inches; it was generally more than 2 inches. He considered the experiments performed confirmed the evidence he had given. With regard to the cases in which a light had been obtained, but not a commercially useful one, the fault was in the shape of the mantle.

This concluded the defendants' evidence.

Professor *Lewes* was recalled to give his opinion on the experiments just made. He said the flame was fairly luminous at the close of the first experiment, owing to the heating of the tube and the formation of carbon in the flame. The experiments would have succeeded better in a perfectly still atmosphere. When the tube was heated, it produced a certain amount of back-pressure, which reduced the proportion of air to gas.

Cross-examined: He had not tried the experiment of heating the defendants' burner. The flame just shown would heat a mantle, but not properly.

Mr. GREY then summed up the defendants' case. He said he could not even now guess what construction could be put on the plaintiffs' specification which would make it valid; and he was equally at a loss to know what construction could be put upon it which would bring the defendants within it.

Mr. MOULTON then commenced his reply on behalf of the plaintiffs.

Thursday, Dec. 14.

This morning, Mr. MOULTON resumed and concluded his speech in reply, and dealt with the alleged anticipations, none of which, he submitted, had any application to Bernt and Cervenka's patent. On the question of infringement, he asked his Lordship to give a broad construction to the claims, because this was a pioneer patent; and he submitted that defendants had substantially taken the plaintiffs' invention. He concluded by making a few observations on the Farkas patent, which he also submitted had been infringed.

His LORDSHIP said he would give judgment next Wednesday (to-morrow).

HIGH COURT OF JUSTICE—CHANCERY DIVISION.

(*Before Mr. Justice* FARWELL.)

Tuesday, Dec. 12.

Corporation of Manchester v. New Moss Colliery Company, Limited.

To-day, his Lordship delivered his considered judgment in this case, in which the plaintiffs sought for an injunction and damages against the defendants in respect of injury done to their reservoirs and other property at Audenshaw by a subsidence of the land caused, as was alleged, by mineral operations carried on by the Company under adjacent ground. The case for the defendants was that, having given the Corporation notice of their intention to work to the limit of their property unless compensated, and the Corporation having ignored the notice, they were entitled to proceed to work their mines in the usual manner, even if by doing so the plaintiffs' land was let down. For the Corporation, it was urged that, even if they refused to compensate the defendants, the latter must not deprive them of the lateral support.

The case was opened on Nov. 21, and the arguments and evidence were reported in the "JOURNAL" for the 5th inst. (p. 692). Mr. Moulton had not quite finished his reply on behalf of the plaintiffs when the Court rose on the 1st inst.; and he concluded the following Tuesday. The arguments turned mainly on certain sections of the Water-Works Clauses Act, 1847; one being section 18, as follows: "The undertakers shall not be entitled to any mines of coal, ironstone, slate, or other minerals under any land purchased by them, except only such parts thereof as shall be necessary to be dug or carried away or used in the construction of the water-works, unless the same shall have been expressly purchased; and all such mines, excepting as aforesaid, shall be deemed to be excepted out of the conveyance of such lands, unless they shall have been expressly named therein and conveyed thereby." Another section relied upon was 22: "Except where otherwise provided for by agreement between the undertakers and other parties, if the owner, lessee, or occupier of any mines or minerals lying under the reservoirs or buildings belonging to the undertakers, or under any of their pipes or works which shall be underground, or within the prescribed distance, if any, and if no distance be prescribed, within 40 yards therefrom, be desirous of working the same, such owner, lessee, or occupier shall give the undertakers notice in writing of his intention so to do 30 days before the commencement of working. Upon the receipt of such notice, it shall be lawful for the undertakers to cause such mines to be inspected by any person appointed by them for the purpose; and if it appear to the undertakers that the working of such mines or minerals is likely to damage the said works, and if they be willing to make compensation for such mines to such owner, lessee, or occupier thereof, then he shall not work the same; and if the undertakers and such owner do not agree as to the amount of such compensation, the same shall be settled as in other cases of disputed compensation." By section 23 it was enacted that if, before the expiration of such 30 days, the undertakers did not state their willingness to treat for payment of compensation, it should be lawful for the owner, lessee, or occupier to work the mines, but he must make good any damage occasioned by working them in an unusual manner.

Justice FARWELL, in delivering judgment, said that the plaintiffs claimed to be owners in fee simple of certain lands in Lancashire, and they sought an injunction to restrain the defendants from working the mines under adjacent land so as to let down the surface. Under their Special Act (10 and 11 Vict., cap. 203), which incorporated the Lands Clauses Consolidation Act, 1845, and the Water-Works Clauses Act, 1847, they were empowered to construct works for the supply of Manchester and other places with water. They accordingly acquired from Lord Stamford certain land, excepting to the grantor all mines and minerals, with full liberty to work them without making any compensation for injury to the surface. They also acquired from John Taylor certain other land, together with all mines, minerals, delphs, and quarries therein. The latter property formed a sort of peninsula running up into, and on three sides nearly surrounded by, the Stamford land. In 1875, they obtained a further Act (38 and 39 Vict., cap. 161) enabling them to extend their works. The facts in the case were not really in dispute to any material extent. The plaintiffs duly constructed their reservoirs, partly on the Stamford land and partly on the Taylor land, more than twenty years ago—a portion of the northern embankment being on the Taylor land; and defendants had worked, and were continuing to work, under the Stamford land in such a way as to cause subsidence to the Taylor land, and to render further subsidences inevitable, whether the workings were continued or stopped at once. It seemed that these subsidences would have occurred whether or not the embankment had been placed on the land. This rendered it unnecessary to refer further to the reservoirs, on the point either of damages or of injunction. The defendants had given notice of their intention to work up to the limits of their property; and the plaintiffs had declined to pay any compensation under the Act, and insisted that they had all the ordinary rights of a common-law owner to lateral support. The defendants contended that the rights of the parties depended on the Water-Works Clauses Act, and that under it the plaintiffs had no such right. The plaintiffs retorted that the Act did not expropriate owners without compensation, but proceeded on the basis that nothing was taken away without compensation; and they contended that nothing had been done or paid to deprive them of the ordinary owner's right to lateral support, and that if they did not choose to compensate the defendants, the latter could only proceed to exercise such rights as they would have had if the Water-Works Clauses Act had not passed. The rights of surface and mineral owners at common law were well settled. Every landowner had, as an incident of his property in land, a right to its lateral support by the adjacent land to an extent sufficient to uphold it in its natural state. Where the surface and the minerals had been severed, the surface owner had a right to support both lateral and vertical, unless a power of working the minerals so as to let down the surface was granted or reserved; and where there was nothing to show how or when the surface and minerals were severed, the same right to support existed. His Lordship then referred to the authorities cited in argument, which he said undoubtedly established that in the case of railway and water-works undertakings the common law in this respect had been displaced by a statutory code. In considering the powers and duties to be given to, and imposed on, undertakers exercising the compulsory powers of the Lands Clauses Act, the Legislature foresaw that in the cases of railway and water-works undertakings, peculiar conditions would exist with respect to mineral rights. They therefore adopted the principle of deferred compensation. They relieved the undertakers from the necessity of immediate purchase, and preserved to the mineral owner his right to be fully compensated when the time arrived at which it became practically possible for him to work his mines, or, in default of compensation, his right to work, notwithstanding that he might thereby let down the surface. In the case of water-works, if the mineowner worked in default of receiving compensation, the undertakers might be liable for injury done to his mines by flooding, under the doctrine of *Fletcher v. Rylands*. This was carried out by sections 18 to 27 in the Water-Works Clauses Act, 1847. Section 18, provided that the undertakers should not be entitled to any mines or minerals under any land purchased by them, except only such parts as were carried away in constructing their works, unless they expressly purchased them, and all such mines were excepted out of the conveyance of such lands unless expressly named and conveyed. Taken either by itself or in conjunction with the following sections, section 18 had the effect of depriving the undertakers of all right to support from the excepted mines as soon as the mineowner was in a position to give notice of his intention to work his mines; and this appeared to his Lordship to be material in considering the effect of the exception in the section. It was contended that it had the effect of placing the undertakers who had purchased the mines outside the Act, and in the position of an ordinary owner in fee. But, inasmuch as the Courts had held, on a consideration of all the sections

named, that a conveyance of land, excepting the mines, did not grant any indefeasible right of support, it was necessary to consider whether there was anything in these sections that would affect the right thus claimed under the exception in section 18, where the conveyance under the statute had been of the mines as well as of the surface. Section 22 set forth that, except where otherwise provided for by agreement between the undertakers and other parties, if the owners of mines under the undertakers' works, or within the area prescribed by their Private Act, or, if none were prescribed, within 40 yards therefrom (which he called the statutory area), were desirous of working, such owners should give 30 days' notice of their intention to work. If the undertakers made compensation, they should not work; but if they failed to do so, the owners might work as if the Act and the Special Act had not been passed. This clause obviously applied to all mines within the statutory area, whether they belonged to the owner of the surface taken by the undertakers or to other persons. The principle of the Act was that no person should be deprived of his mines without compensation. If the owner of adjacent mines were not the same person as the owner of the surface taken, he was within section 22, and could work without giving notice. If he gave notice, he was entitled to compensation or to work with the benefit of section 27. This was clear, if the surface owner had sold the surface only. And how could any act of his alter the rights of the adjacent owner? If, as Mr. Moulton had argued, the principle of the Act was compensation, not expropriation, why was the owner of the adjacent mines to be deprived of his rights under sections 22, 23, and 27 by the payment of compensation to another person? It was true that the owner at common law who sold the fee sold also the rights that he had to lateral support. The answer must be that in this case section 18 did not put the undertakers in the position of the ordinary owner in fee, but in the position of an owner in fee according to a statute which gave them such rights only as they could possess and enjoy consistently with the rights given to others by the same statute. This left untouched the case where the owner of the surface who sold the mines as well was also owner of the adjacent mines. It might be that he granted the right to subjacent support, if he got compensation which covered it; but this did not apply to the case of the adjacent mineowner who had received no compensation, and had done nothing to displace or defeat his statutory rights. If this were not so, a water company might purchase a strip of land a few yards wide and long with the mines below, and, by building a wall of their reservoir upon it, prevent large areas of coal from ever being worked, without paying any compensation at all, and without the liability imposed by section 27. He agreed with Mr. Moulton's contention that the Lands Clauses and Water-Works Clauses Acts were based on the principle that expropriation and compensation went hand in hand; but he applied it against the plaintiffs in favour of the owner of adjacent minerals, who was not to be expropriated without compensation. There was no reason for expropriating the plaintiffs, for they were the persons with statutory power to expropriate others; and the real question for decision was as to what extent of estate and interest, on the true construction of the Act, they had succeeded in appropriating to themselves. He therefore held that the defendants were entitled to work within the statutory area, whether or not they let down the plaintiffs' reservoirs. The next question was as to the rights of the parties situated outside the statutory area—in this case 40 yards, as the plaintiffs' Private Acts gave no other limit; for he found, on the evidence, that workings outside as well as within the area had caused subsidences on parts of the plaintiffs' embankment on the Taylor land, though it was not possible to distinguish between the effects produced thereby. The extent of the statutory area was left to the discretion of the undertakers, just as the extent of the land to which their compulsory powers, and the limits of deviation therefrom, were left to them. The obvious intention of the Water-Works Clauses Act was that the undertakers should state the area from which they required support, and should be authorized to acquire such support with the special privilege of deferring payment for compensation. Their contention was that they were entitled to support beyond the area so chosen by themselves without paying any compensation—that they could give themselves rights without payment, by neglecting to secure a proper area of protection, either intentionally or from lack of foresight. He could not construe the conveyance according to the statute under section 18 as giving them any such rights. The undertakers had been given the powers and privileges in the statute in exchange for all other rights in respect of support, whether lateral or vertical. If they could not claim the benefit of section 22 to an extent sufficient to protect their works, because they failed to extend the statutory area sufficiently, they had only themselves to thank. He could not construe the Acts so as to enable them to increase their rights by their own defaults; and there was all the more difficulty in the plaintiffs' way, because this right claimed by them was one to which it would be very troublesome to give practical effect by way either of injunction or of damages. He ventured to think he was following the principle of the decision in *Pountney v. Clayton*, quoted by Mr. Moulton, in holding that undertakers could not claim under conveyances made in pursuance of Acts incorporating the Railways Clauses and the Water-Works Clauses Acts—whether such conveyances were of surface only or of surface and minerals—any right to support from land belonging to any person to whom they had not paid, or were not ready and willing to pay, compensation under the Act. The result was that the action failed, and would be dismissed, with costs.

Mr. JENKINS intimated that the Corporation intended taking the case to the Court of Appeal.

HIGH COURT OF JUSTICE—REFEREES COURT.

(*Before Mr.* MUIR MACKENZIE.)

Ocean Accident and Guarantee Corporation, Limited, and Others v. Ilford Gas Company—Damage to Houses caused by Floods.

This was an action for the assessment of damages (if any) caused to 209 houses on the Manor House Estate, Ilford (of which plaintiffs are owners and mortgagees in possession), resulting from the negligence of the defendants in obstructing an ancient watercourse known as the Aldersbrook, which flowed through their gas-works. The question of liability had been fought out in two previous trials—the first, before Mr. Justice Darling, when the Jury disagreed; and, secondly, before Mr. Justice Lawrance and a Special Jury, when an adverse verdict to the defendant company was returned.* The present action before the Official Referee was commenced on Tuesday last, and was not concluded at the time of going to press this week.

Mr. MONTAGUE SHEARMAN, K.C., and Mr. D. C. LECK appeared for the plaintiffs; and Mr. H. E. DUKE, K.C., and Mr. SYLVAIN MAYER for the defendants.

Mr. SHEARMAN, in opening, said that the damage done to the plaintiffs' leasehold interest consisted in the effect of damp on the houses, which were let to weekly tenants; in the subsidence of the structure of several of them; in loss of rent; and in not obtaining such a good class of tenant as before the flood.

Mr. *Edwin Evans*, the Estate Agent, was the first witness, and was examined by Mr. LECK. He said the tenants were constantly complaining of the water in the houses, dampness behind the skirtings, and wet walls. Concrete had been put into some of the houses under the ground floors. The wall footings had shifted, owing to the action of the flood water; and £550 had been expended in consequence. In all, £8960 was claimed.

Cross-examined by Mr. DUKE, witness said the houses in question were built on alluvial land, where particular care was required. They were erected in the cheapest manner possible, and were of the speculative builder type. The property had been previously neglected. Wooden dados were sometimes added to cover up dampness. He did not know that the Local Authority had since the flood raised the height of the datum line for building.

Mr. *J. A. Hale*, assistant to the previous witness, was called, and cross-examined in detail as to the figures of the rent-roll both before and after the flood. He was recalled on Friday; and his further cross-examination lasted beyond the whole day. Its purport was to challenge each amount of repair or alleged damage, as to its being caused by the flood, and the justification for expecting the Gas Company to pay for the various items. In nearly every case the repairs done were shown to have been executed just before the entry of new tenants.

Mr. *J. F. Beckett*, rent collector, gave evidence as to the flooring being in a state of "dry-rot."

Mr. *Lewis Solomon*, F.R.I.B.A., gave expert evidence as to the repairs reputed to be required; his estimate for the work coming to £16 per house.

Cross-examined by Mr. DUKE, he said he had no particular experience of the drainage in the Ilford district, nor of the tidal levels. He had been told of the flood, and estimated the damage according to what he thought must have occurred. "Dry-rot" would be caused by the presence of dampness and the absence of ventilation; so that ineffective damp-courses and insufficient air-bricks might produce it. Asphalte made the best damp course; then slate and cement; and some used tarred felt, as in these houses.

WEST RIDING ASSIZES, LEEDS.

(*Before Mr. Justice* DARLING *and a Special Jury.*)

Kershaw v. Sheffield United Gaslight Company—An Unsuccessful Action for Damages for Personal Injuries.

This was an action (the hearing of which extended over three days) in which Arthur Kershaw, a Sheffield ironmonger, sought to recover damages from the Sheffield United Gaslight Company for personal injuries alleged to have been caused by their negligence.

Mr. T. R. D. WRIGHT and Mr. H. R. BRAMLEY appeared for the plaintiff; Mr. E. TINDAL ATKINSON, K.C., and Mr. H. T. WADDY represented the defendants.

Mr. WRIGHT, in opening the case, said that on May 3 plaintiff met some friends at the Garrick Hotel, and left there at eleven o'clock. He took a tramcar; and when about 200 yards from home, he got off to walk the rest of the way. On the right-hand side of Langsett Road (where he lived), he found himself tripped up by a rope, and was tipped headlong into an excavation, which he had not seen, and had no means to see. He was taken out of the excavation in an unconscious condition, and was found to have sustained serious injuries to one of his feet. Until near the end of July, he was an out-patient of the Infirmary. In addition to his injuries, he suffered from shock, and was off his work until August. The defendants had a right to make excavations on the public highway; but this was subject to their taking reasonable precautions to protect the passers-by, who had as much right to the highway as they had. The Act imposed upon them the condition that they should properly fence off the excavation. In this instance, the excavation was made for the purpose of laying pipes, and to some extent it went on to the highway. It was about 4 feet wide, 5 feet long, and 5 feet deep, and demanded proper fencing. There was no light at all, though of this fact the defendants had been warned just before the accident. They had put up a rope; but this had been allowed to get in such a position that if it had been placed to trip anybody up it could not have been better done. It would be said that plaintiff was under the influence of drink; but he contended that the excavation ought never to have been left in the condition it was.

Plaintiff, having borne out Counsel's statement, was closely cross-examined by Mr. TINDAL ATKINSON as to the amount of drink he had consumed on the night referred to. He said that during the day he drank only ginger ale; but in the evening he had backache and took two or three gins "to ease the pain." He did not see any lights round the excavation.

Among the numerous other witnesses called were Mr. *Green*, of the Garrick Hotel, who said plaintiff was perfectly sober when he left there, and *Frederick Murray* and *George Reden*, two employees of the Corporation, who did not consider that the excavation was properly

* See "JOURNAL," Vol. LXXXIX., p. 366; and Vol. XCI., p. 324.

fenced. Several persons who were on the spot at the time of the accident also denied that plaintiff was drunk.

Frederick Smith, a foreman in the employ of the Gas Company, was the first witness for the defence. He said that the usual practice, when a hole was made in the ground, was to drive stakes around it, and then, by means of a rope passed through eyelets, fence off the excavations. On the occasion of the accident, witness, before leaving for the night, saw that the hole was properly guarded; there being two ropes around it, one 18 inches and the other 3 ft. 6 in. from the ground. There were also battens on the inner side.

Cross-examined, witness said that when he came on duty again the following morning, he found the ropes were a little slackened. There had been no lamps round the place when he left work.

His LORDSHIP said that, in his opinion, the whole matter turned on whether the place was lighted. If it was not lighted, a man walking against ropes or battens in the dark would probably fall over them.

Alfred Ward, a Corporation foreman, said that, on reading the commencement of the case in the papers, he volunteered to give evidence. He was walking along Langsett Road on the night of the accident; and he saw a man being assisted across the road. The man was making a noise; and he found that he had fallen into the excavation. Witness went for the watchman, and together they examined the excavation. The ropes were secure, but slightly slackened. They looked as though someone had fallen over them. There were four lamps in the vicinity of the excavation. They were all properly lighted, and giving a good illumination.

Jackson, the night watchman, said he placed a lamp at each corner of the excavation, and had examined them a few minutes before the accident.

Police-constable *Steel*, who saw plaintiff after the accident, said he thought he had had some drink. On coming from the direction of Sheffield towards the excavation, he noticed a red lamp burning brightly.

Mr. TINDAL ATKINSON, for the defence, said the evidence was highly suggestive of the condition the plaintiff was in. If a man got drunk and deprived himself of his senses, he could not complain if, subsequent upon people having taken all the precautions necessary for reasonable persons, he, because of his condition, came to harm.

Mr. WRIGHT remarked that the most important question was whether there had been any negligence on the part of the Company. The point as to whether or not the man was drunk was secondary; and, in any case, witnesses had been called who said he was sober. He suggested that the lamp which was seen by the witnesses called for the defence was a lamp brought by an onlooker when the plaintiff was being got out of the hole.

His LORDSHIP, in summing up, said that it was perfectly clear that the plaintiff was a man who could not take much drink. He was not fit to walk home, though he was not incapable; and whether the hole was properly lighted or not, he was much more likely to fall and come to injury than if he was sober. The Company were not bound to guard a hole in such a way as to exclude from it a man so drunk as to be incapable of seeing a light when it was there. It would be perfectly intolerable if public bodies doing necessary public work had to take means to safeguard people who could not take care of themselves because, of their own voluntary act, they had rendered themselves incapable. As to the question of whether the excavation was reasonably guarded, he thought the evidence went to show that there were lamps there.

The Jury, after re-calling the police-constable, and questioning him further as to the position of the lamps, returned a verdict for the defendants.

Broughty Ferry Gas Worker's Dismissal.

In the Sheriff Court at Dundee, on Tuesday last, John Dickson, gas worker, of Dundee, sued the Corporation of Broughty Ferry for 35s. as a week's wages, and for 5s. as a day's lie time, to which he claimed to be entitled on his dismissal by the Gas Manager. When the pursuer was dismissed, he was paid 35s. as a week's wages in lieu of notice. He contended that, according to his engagement, he was entitled to a fortnight's notice. In evidence, he admitted that he was dismissed for refusing to do certain work which he was asked to perform. Mr. G. Keillor, the Manager, said that, through his disobedience, the pursuer forfeited his right to any notice or compensation. Sheriff-Substitute Campbell Smith said he did not think that Dickson behaved exactly as he ought to have done, nor did he think he was intentionally, knowiingly, or maliciously disobedient. He was left too much in the dark as to what he ought to have done, and the reasons for doing it, when it was seen he was not disposed exactly to do what he was told to do. Dickson had suffered enough in losing a position through his stupidity and ideas of independence, which were far too common in Scotland. He could not say the Town Council of Broughty Ferry had dealt unhandsomely with the pursuer; but he would give him a little more—namely, 10s. damages and 10s. expenses.

Fire at the Wolverhampton Gas-Works.—There was an outbreak of fire in the engine-room at the Wolverhampton Gas-Works last Saturday morning, caused by the end of the exhaust chamber of one of the gas-engines being blown out. As the result, a large quantity of gas was liberated and became ignited. When the police fire brigade arrived, the engine-house was full of flame; but the adjoining canal provided a plentiful supply of water, and the fire was extinguished in about an hour's time.

Acquisition of the Blyth Water-Works by the District Council.—The works at Lysdon, which since 1854 have supplied South Blyth (Northumberland) with water, are about to be transferred from their present owner, the Right Hon. Viscount Ridley, to the District Council. The works have been in the hands of the family since they were constructed; and it appears that the late Lord Ridley was favourable to their sale to the Council. This has now been effected on what are regarded as generous terms; and the purchase will be completed on the 1st of May next.

MISCELLANEOUS NEWS.

THE GAS QUESTION IN PARIS.

Rejection of the Bill for Municipalizing the Supply.

The French Senate had under consideration last Thursday the Bill for placing the gas supply of the city under the direct control of the Municipality as from the 1st prox., which, as already recorded in the "JOURNAL," was passed by the Chamber of Deputies on the 13th ult. The Bill had been considered by a Committee of the Senate, who, as mentioned last week, decided by five votes to two to recommend the rejection of the Bill. The debate was opened by M. Paul Strauss, the Radical member for the Seine, who emphasized the danger attending a continuance of the present disagreement between the two sections of the Legislature on so important a question as the supply of gas; and he urged the Senate not to adopt the Committee's recommendation. He was followed by the Minister of the Interior (M. Dubief) who warmly defended the principle of direct control to which the Chamber of Deputies had agreed, and criticized, and endeavoured to refute, the objections brought forward by its opponents. The conclusions arrived at by the Committee were ably defended by M. Prevet, the reporter, who pointed out that the question at issue was one which was not merely of local interest, but concerned the political and economical government of the entire country. He expressed his pleasure at finding that the most important vote on the question when it was before the Chamber—that taken upon the preamble of the Bill—was given with a much smaller majority than was recorded on the previous occasion. M. Prevet concluded by declaring that the direct municipal control of the gas supply would be a step in the direction of Collectivism; one of the principal items in the Socialist programme being the municipalization of public services. At this point, M. Maurice Rouvier, the President of the Council, intervened in the debate, to explain to the Senate the views of the Government on the question before them. He said the proposal to municipalize the gas supply had emanated from the Municipal Council, who had expressed their perfect willingness to undertake the responsibility of carrying on this important service. They had already afforded many proofs of their political spirit, their wisdom, and their moderation. If they failed in the discharge of their duties, they would have to answer for it to the electors. Moreover, the Chamber had on two occasions decided in favour of placing the gas supply under direct municipal control. Was it the wish of the Senate to thwart the Municipality in their object? He appealed to the Republican majority, and to the entire body of the Senate, to support M. Strauss, and thus afford one more pledge of Republican unity and of good understanding between the two Chambers. M. Rouvier's remarks were very cordially received by the Left. When the applause had subsided, the general discussion was declared to be closed, and the report of the Committee put to the vote and adopted by 153 votes to 125—a majority of 28.

LOCOMOTIVES AND WAGGONS ON RAILWAY SIDINGS UNDER THE FACTORY ACT.

Amendments Proposed to the Regulations Affecting Gas Undertakings.

The Home Office Inquiry with respect to the proposed regulations for the use of locomotives and waggons on lines and sidings under the Factory Act, was continued at the Caxton Hall, Westminster, on Wednesday, before Mr. CHESTER JONES. The previous proceedings, so far as they related to gas undertakings, were reported in the "JOURNAL" for the 28th ult. (p. 629).

Mr. HONORATUS LLOYD, K.C., said he appeared on behalf of the Scottish Corporations in their capacity of gas undertakers. Of course, the regulations proposed originally raised such issues that his clients felt bound to strenuously oppose them; in fact, many of them would have rendered the conduct of their business quite impossible. But from the outset they had desired to meet the Home Office in a reasonable spirit; and it was therefore with great pleasure that they perused the second draft put before them. The result had been that, after very careful consideration, they found that, in the main, they were quite able to accept the proposals of the Home Office as being reasonable and in the interest of all parties. At the same time, there were some few matters of more or less varying importance—some of them relating to drafting only, and some going further—which he desired to put forward on behalf of his clients; and he had had printed draft regulations showing the amendments proposed by them. This had been done with a view of facilitating the matter, and they showed exactly, by printing in italics and by deletions, the various suggestions they desired to put before the Commissioner. He was prepared to call the Engineers of the various Corporations concerned, if this course should become necessary; but after he had gone through the proposals, he hoped it would not. With regard to Regulation 3, it would be seen that they had put upon an employee an obligation not to cross between two waggons on the same line of rails unless the waggons were at least a length apart. The first alteration of importance came under the definition of "gantry;" and they proposed it with a view of carrying out what they took to have been the intention of all parties from the beginning. As he understood, it was never meant that the word "gantry" should hereafter be interpreted to cover anything in the nature of a tip or embankment; and therefore they had endeavoured to find some words which would limit the meaning so as to exclude any such interpretation. They proposed, therefore, that "gantry" should mean an elevated structure "of wood, masonry, or metal" exceeding 6 feet in height, &c.

Mr. WILLS, for the Home Office, said he should have thought that

an embankment was often made of masonry, and that a tip was largely a wooden structure; and therefore it was only a matter of drafting. But his objection in substance was that he did not see on what ground either a tip or an embankment should be excluded. Reference had been made at an earlier stage to the word "embankment;" and no doubt an embankment with a sloping bank would be hardly within danger of the rule.

The COMMISSIONER: What I understood Mr. Lloyd meant was that a tip was in the nature of an embankment.

Mr. LLOYD: Yes; that is so.

Mr. WILLS said he was only speaking in reference to the South Wales tips. His view with regard to the tip was that it was very difficult to draw the line, because sometimes the tip was intended to be used afterwards as a gantry.

The COMMISSIONER: Would it not always have sloping sides, in the same way as an embankment?

Mr. WILLS: We are quite content that this should be excluded.

Mr. LLOYD: It is obvious that we have the same intention; and it is merely a question how to carry it out.

After some further discussion,

Mr. WILLS reiterated that he was quite content with the amendment.

Mr. HUTCHINSON, on behalf of the Institution of Gas Engineers, the Bristol Gas Company, and several others, associated himself with the amendments mentioned by Mr. Lloyd. He said he did not think he need interpose; but if it should prove to be necessary to support Mr. Lloyd on behalf of his clients, perhaps the Commissioner would permit him to do so when the occasion arose.

The COMMISSIONER assented.

Mr. H. BEVERIDGE, on behalf of the Corporation of Edinburgh, supported the amendments.

Mr. SIMON, for the Gaslight and Coke, South Metropolitan, and Commercial Gas Companies, said they had been to some extent associated in discussing this matter.

The COMMISSIONER: I suppose everybody here will be satisfied with what Mr. Lloyd gets?

Mr. SIMON: It remains to be seen what he gets.

Mr. LLOYD stated that, so far as gas was concerned, they had, in the interests of all parties, met the London Gas Companies, and had endeavoured to come to a common line of action.

Counsel then proceeded to go *seriatim* through the amendments, both of insertion and deletion, proposed to the draft regulations; and, in the main, they were assented to by Mr. Wills.

Mr. SIMON, at a subsequent stage of the proceedings, called Mr. *W. Doig Gibb*, the Engineer of the Newcastle-on-Tyne and Gateshead Gas Company, who testified that by one of the proposed regulations there would be not only the sacrifice of 3 feet of space beside the rails, but the use of overhead gantries would be reduced. They did not object to recesses being made; but in order to do so the men would break another regulation.

The case for other manufacturers, the steel industries, and the blast and other furnaces, was next proceeded with.

THE QUALITY OF THE GAS AT NOTTINGHAM.

A Reported Solution of the Mystery.

Last Saturday's "Nottingham Daily Express" contained the following remarks with reference to the recent agitation on the subject of the quality of the gas supplied at Nottingham.

The Nottingham Gas Committee met yesterday to discuss the report of their Sub-Committee appointed to investigate the remarkable disclosures made at one of the principal gas-producing depôts. What has been going on, the Sub-Committee explained, was that at certain times —principally in the early morning—quantities of gas of very poor illuminating power, gas which ought never to have been turned into the mains, has been sent out from the works. This would probably remain in the pipes in clouds; drifting almost throughout the system as the consumption drew the gas along. So poor was the quality of this stuff, that even when mixed, as it would mix to a certain extent, with the higher illuminating power gas, the light given would be less than 8-candle power, instead of the standard of 15½ candles. The gas was not impure; and therefore the automatic tests which are in operation would show no sign. The discovery, therefore, of the cause of the trouble has taken a long time, and has caused intense anxiety. The bad gas in most instances would only be given off for perhaps half-an-hour or an hour at a time; and consequently when, in response to complaints, the Manager or other officials went to make an examination, it had all passed, and the light had resumed its normal power. An intelligent description of the circumstances by one consumer who complained, roused the Manager's suspicions as to what was actually going on; and special surveillance resulted in the discovery of the root of the whole trouble. The remedy was promptly applied; and for the past week the gas has been consistently of high-candle power. So many unfounded rumours have been in circulation during the last few days in regard to the affair, that it is only fair to those concerned to explain that the Committee have not attributed any wilful intent to anyone. Rather it has been, it is suggested, an excess of zeal to obtain better returns than the plant was capable of. The Gas Committee yesterday fully considered the whole of the points involved, and finally decided that, in view of the seriousness of the matter, a special meeting of the Council should be summoned, and the whole question laid before them. The Council will be called probably early next week. The dissussion will be *in camera*.

We have received from Messrs. George Glover and Co., Limited, a combined blotter and calendar for next year. By the side of the latter (which shows all the months at a glance) is an illustration of the two 3000-light dry meters recently made by the firm for use with gas-engines, and noticed in the "JOURNAL" for the 7th ult.

CONTINENTAL UNION GAS COMPANY, LIMITED.

The Ordinary General Meeting of the Company was held last Tuesday, at the London Offices, No. 7, Drapers' Gardens, Throgmorton Street, E.C.—Mr. ARTHUR LUCAS in the chair.

The SECRETARY (Mr. William Martin) read the notice convening the meeting; and the Directors' report and the accounts (the former of which was published in the "JOURNAL" for the 28th ult., p. 631) were taken as read.

THE ELECTION OF AN ENGINEER AS DIRECTOR.

The CHAIRMAN said that, before dealing with the report and accounts, he wished to refer to the election of Mr. Arthur Phillips to a seat on the Board. Mr. Phillips was a gentleman so well known in the gas world that he need say little to justify this election. On a previous occasion, he stated that there were objections to Engineers being appointed Directors of Gas Companies; but there were exceptions to every rule, as he knew from experience in another Company, in which, as a Director, an Engineer had rendered most valuable services, both technical and administrative. Mr. Phillips was another exception. It was not merely because he was a Gas Engineer that the Directors elected him, but because he was an Engineer who had devoted his energies (and with marked success) to the commercial side of his profession. He had acquired great experience, especially in Italy, in the management of gas-works. When he added that Mr. Phillips was Chairman of two Foreign Gas Companies, the proprietors would agree that the Directors were fully justified in electing him; and they might congratulate themselves on having secured the services of so able a Director.

BRIGHTER PROSPECTS—CAPITAL AND REVENUE.

When they had the pleasure of meeting the proprietors at the last annual meeting, it would be remembered that the Directors promised the publication of the accounts, which had consequently been sent to the proprietors, together with the report. He was, he trusted, justified in believing that the study of these accounts had convinced them that the finances of the Company were in a sound condition; and he hoped that the brief statement he was about to make would prove to them that the prospects were brighter than they had been for some time past. As they had practically to deal with the affairs of two Companies, he would first refer to the accounts which were before them, and then pass on to those of the Union des Gaz, which was the Company, as the proprietors well knew, in which the Continental Company were so largely interested. Turning first to the balance-sheet, and to the heading of "By Continental Union Gas Stock," the proprietors had not forgotten the circumstances which lead to the allotment of this £60,000. The Directors had invested the whole amount in the stocks of first-class gas companies, all of which would pay between 4 and 5 per cent. on the purchase price. As the £60,000 could not be invested to yield the 6½ per cent. dividend the Board recommended to be paid to the proprietors, there would be a difference of about 2 per cent., or £1200 a year, between the dividends they paid and those they received on the investments. He also wished to draw attention to the next item in the balance-sheet—namely, £737,000, as the value of Union des Gaz shares held by the Company. It must be borne in mind that this sum represented only the face-value (which was £20) of these shares; and as they were now quoted at about £34, their real value was represented by a much larger amount. Turning to the general revenue account, the proprietors would observe that the result of the year's work was that £62,723 had been earned, which was somewhat less than last year, owing principally to an increase in the wages payable under the new labour regulations imposed on the Company at Messina. There had been a satisfactory increase in the amount of gas sold, and coke and tar sales had improved; and there was every prospect of this improvement being maintained. He must allude, as he did last year, to the large sum which was still due to the Company from the Municipality of Messina. On the 30th of June, 1904, this debt amounted to £26,160. Since that date, and up to June 30 of this year, they had received a sum on account; but the debt still stood at £24,784. As stated in the report, the Municipality had not carried out their engagements; and meanwhile interest at 4 per cent. was accruing on the amount of the instalments as they fell due. The proprietors might rest assured that the Directors were doing all they could to obtain payment of this large debt. Mr. Phillips had just returned from Messina, where he had been in communication with the town authorities; and the Board hoped a satisfactory arrangement would soon be arrived at. The Municipality fully acknowledged their indebtedness; and there was agreement as to the amount. But when they had to deal with a Corporation who had nothing in their coffers, it was very difficult to settle matters. The Board had, however, submitted terms which it would be unwise on the part of the town to reject. It would be noticed in the profit and loss account that £67,462 was available for dividend; and this amount would have been larger had it not been necessary to provide £3960 for the amortization of the works at Messina and Montargis. The Directors proposed to recommend a final dividend of 3½ per cent., which, with the 3 per cent. paid in July last, would make a total dividend of 6½ per cent., which was the same as that of 1904. They felt they were justified in recommending this dividend, as the improvement in the results of the working of the Union des Gaz stations for many months had been most marked; and there was every prospect of a continuation of this improvement.

AFFAIRS OF THE UNION DES GAZ.

Passing on to the affairs of the Union des Gaz, the Chairman said he did so with pleasure, as the sales of gas had been most satisfactory, showing as they did an increase of 6 per cent. The cost of coal had decreased 6d. per ton, the selling price of coke had increased 6d. per ton, and tar, &c., were fetching 5d. per ton more than last year. With regard to coke, the sales were excellent; and a further increase in the average selling price might reasonably be expected. The results of the year's work showed an increase in the net profits of £758; and the dividend declared was the same as in 1904—carrying forward £8246, or

£755 less than the previous year. The Company were now feeling the effects of the payment of interest on the capital raised by the issue of obligations, or, as they would be called here, debentures.

MILAN, GENOA, AND OTHER STATIONS.

As he explained last year, the growth of population and the industries in Milan and Genoa had for some time been quite remarkable, with a corresponding demand for gas, so that the construction of new works which the Directors hoped could have been postponed, had to be commenced immediately in both these cities. The land had been purchased, and the necessary buildings and machinery would be erected without delay. The Board of the Union had wisely decided not to erect larger works than were required in the immediate future—that was to say, the works would be built in sections, each section to be constructed as required. Mr. Birchenough and himself had lately visited these stations; and they were pleased to find in Milan a very notable improvement in the state of affairs. The new retorts were giving satisfaction, which was indicated by the marked improvement in the carbonizing returns they had received. The proprietors would be glad to know that the men had been working better, and at present were giving no trouble. In fact, the visit to Milan was a most satisfactory one. They came away feeling pleased with the general condition of the station; and great credit was due to the whole staff of engineers who had worked hard to improve these works, and to obtain such improved results. At Genoa, Mr. Birchenough and himself were equally pleased. Any of the proprietors who had visited Genoa would appreciate the difficulty there was in obtaining sites for ordinary buildings, and (when they considered how much land was required for a gas-works) how hard the Board found it to get a site suitable for their purpose. Nevertheless, a good one was at last found; and the new works at Gavette would, as he had said, be constructed immediately. Since 1900, there had been an increase in the gas sold at Genoa of 31 per cent.; and as the existing two works were incapable of extension, it would be seen how forced the Union Company were to meet this extraordinarily increased demand, which there was every prospect would continue. It was not only in these Italian cities that the expansion existed, for in Strasbourg the increase in gas sold had been, since 1900, 20 per cent.; and here again, in the immediate future, new works might have to be built. On their way to Italy, Mr. Birchenough and himself visited Strasbourg. They drove all round the city, and noted progress and expansion in every direction; and there was no doubt the city had a prosperous future before it. Again, at Rueil, in the neighbourhood of Paris, where new works had lately been constructed, there had been an increase amounting, since 1900, to as much as 36 per cent.; but these fine works were quite capable of supplying enough gas for the district for some years to come. The Union des Gaz had, the proprietors would be pleased to hear, secured a concession for the lighting of Kehl, near Strasbourg. The Company had also succeeded in renewing the concessions in the neighbourhood of Rueil, and obtaining contracts for the lighting of two new communes near the town. He must ask the proprietors to bear in mind that all these purchases of land, these extensions of works, and the obtaining of new concessions involved a corresponding increase of capital expenditure—an immediate expenditure, and one that would continue for some time to come. But, on the other hand, the Directors were perfectly justified in believing that the increase in the profits of the Union des Gaz would cover the larger amount of interest to be paid on the sums which would have to be raised to pay for all this work. How the money would be obtained, he was that day not prepared to say. But he had not much doubt that, considering the excellent credit the Company enjoyed in France, there would be little difficulty in raising the necessary capital.

A HOPEFUL OUTLOOK.

It had been a great pleasure for him (the Chairman) to meet the proprietors without having to account for losses and disasters; to be able to report a general advance in the business; not to have to tell of misunderstandings with municipalities; and, above all, that there had been no serious labour troubles during the past year. The Directors could only hope that the Company's comparatively prosperous state would continue, and that they would be spared the misfortunes which had beset them in the past years. He could not too often repeat that these misfortunes were chiefly due to the errors of many years ago. If in the past, when profits were far larger than they were in these days, smaller dividends had been paid, and the money so saved had been spent in enlarging and improving the works, and in setting aside funds to meet the extraordinary expenditure, they would be in a far better position than they were now. Not that this position was a bad one. On the contrary, he thought, and he hoped the proprietors would agree with him, it was a good one. It would be the duty of the Directors to endeavour to improve it; and there was every reason for hoping they would succeed. He moved that the report and accounts be received and adopted.

The Deputy-Chairman (Mr. Frederick Tendron) seconded the motion.

Mr. F. J. Butcher observed, with regard to the position at Messina, that he noticed the Chairman was fortunately able to say there were no difficulties with the Municipality. But he saw the instalments of the indebtedness of the Municipality had not been paid regularly; and he should like to know how this was going on.

Mr. E. A. Goulding, M.P., said it was with great gratification that he had received on this occasion a copy of the statement of accounts. At previous meetings, he had had considerable difficulty in following criticisms through not having the accounts for reference. The proprietors must all be glad this had now been vouchsafed them. He was bound to say that the whole tone of the Chairman's speech was more full of hope and promise for the proprietors than he had heard on many other occasions. The Company had now got through a great many of their troubles, and the prospect was bright. He thought the Directors had done exceedingly well in being in a position to give the proprietors the balance of 3½ per cent. for the past year. They as proprietors could not lose sight of the fact that by the allotment of the £60,000 they had received a bonus representing a considerable addition to their individual incomes. He did not suppose there would be any difficulty, with their prospect of success, in raising as required the necessary capital for either the Union des Gaz or this Company. He hoped that some of the gloomy predictions which were held over the Company, not in this year alone but in past years, would be swept away by the Chairman's remarks.

The Chairman, in reply, said with regard to Mr. Butcher's question, they had no squabble with the town of Messina; their relations were perfectly friendly. The only thing was that the Municipality had no money; and they were trying to raise it. As soon as they did this, they would pay the Company, *plus* 4 per cent., on any amounts that were owing now. There was no quarrel with the town of Messina; and he had nothing to add in regard to this matter to what he had already stated in his speech. He (the Chairman) was personally much obliged to Mr. Goulding for the remarks he had made; and the whole of the Board very much appreciated them.

On the proposition of the Chairman, seconded by Mr. N. E. B. Garey, a resolution was passed declaring a dividend of 6½ per cent. on the ordinary stock (free of tax), and of 7 per cent. on the preference stock (less tax), deducting the interim dividend of 3 per cent. on the ordinary stock and 3½ per cent. on the preference stock.

RE-ELECTIONS OF DIRECTORS AND AUDITORS.

The Deputy-Chairman, in moving the re-election of the retiring Directors (Mr. Arthur Lucas and Mr. R. Hesketh Jones), said it was a great privilege to him to propose this resolution; and he was sure the proprietors would unanimously re-elect the Chairman to the Board. To him (Mr. Tendron) it was a very great pleasure to see the shareholders that day placing the confidence they always had placed in their Board, and so much appreciating the truthful and able remarks of the Chairman. The members of the Board respected Mr. Lucas very much. There was not a member on the Board who was not delighted to have him as their Chairman [Hear, hear], and perfectly happy to serve under him; his desire for the welfare of the Company was most earnest; and he never hesitated about sacrificing himself if he saw he could do any good to the Company, or that his services were required either at Milan, Genoa, or elsewhere. His courtesy in conducting the business, too, was very marked. With regard to Mr. Hesketh Jones, he need not say much, for he had been well known in the gas world for many years. Mr. Jones was his (Mr. Tendron's) senior by a few years; but if he could have the energy that Mr. Jones had until he reached his age, he should be very glad. He was another gentleman who, if he was wanted in Milan or anywhere else, was always ready to go; and the greatest pleasure they could give him was to find him plenty of work to do.

Mr. R. S. Gardiner seconded the motion.

The Deputy-Chairman, in declaring the resolution unanimously carried, said he hoped that the next few years' work would not be so arduous or terribly trying as the last five years.

The Chairman and Mr. Hesketh Jones responded.

Moved by Major Inglis, and seconded by Mr. Walter Hunter, the Auditors (Mr. A. T. Eastman and Mr. C. P. Crookenden, F.C.A.) were also re-appointed.

OFFICERS AND DIRECTORS HEARTILY THANKED.

Mr. J. H. Birchenough, C.M.G., moved a vote of thanks to the Secretary, Managers, and Engineers and staff of the Company and the Union des Gaz. He remarked that experience in the work of another Company taught him how much the success of a Company carrying on business abroad depended upon its staff both in London and in the countries in which the business was conducted. He was confident they had, both at home and at their various stations, a most able and loyal staff, to whom their thanks were due that day for their services during the past year.

Mr. A. F. Phillips said he had much pleasure in seconding this vote of thanks. He had, during the year, visited all the stations in Italy—some of them twice, and could testify to an earnest desire on the part of the General Managers, and of the staffs under them, to use their best endeavours in the Company's interests. While on his feet, he might supplement the Chairman's remarks with regard to Messina, by stating that the Syndic and Junta received him in the most friendly manner, and only regretted that the state of their cash-box did not allow them to pay the amount owing to the Company.

The motion was cordially carried.

Mr. Walter Hunter moved that the best thanks of the proprietors be given to the Chairman and Directors for the able way in which they had conducted the affairs of the Company. Last year they were somewhat under a cloud. For the past few years the Board had had great difficulties to contend with; but the proprietors had always had confidence that the gentlemen who were conducting their affairs were fit to be entrusted with their great charge. The Chairman in his speech that day had given them such a good account of the stewardship of the Board, and the way in which the works of the Company were being carried on, that he was quite certain all the proprietors felt a deep debt of gratitude to the Chairman and his colleagues.

Mr. E. Clark, in seconding the motion, said he had been somewhat of a critic at former meetings, and that intensified the pleasure he had in seconding the vote of thanks to the Directors. There had never been any serious difficulties between the proprietors and Directors; and he hoped their happy relations would be maintained.

Mr. H. D. Ellis said, while he agreed with everything that had been mentioned, he also rather more appreciated one thing that had been left in eloquent silence. There had been no allusion in the room to an increase in the dividend.

The motion was heartily agreed to.

The Chairman, in reply, said it was a little difficult, under the extraordinary circumstances, to find words in which to thank the proprietors. Perhaps they might have thought it was rather ungracious of him, when Mr. Tendron made the kindly reference to himself, that he should merely have accepted it without any remarks; but he knew he should have an opportunity of thanking him, as he did most sincerely, for what he had said; and he also wished to avail

himself here again (he was sure the proprietors would pardon him for referring to himself) of the opportunity for thanking the proprietors for the support they had given him during the troublous times of the last three years. If he did not feel that the large body of proprietors gave the Board their full support and confidence, the position would have been an untenable one. It was a trying one, but was much less trying owing to the kindly help the proprietors gave the Board during the time. The Board was a very hard-working one. They gave a large part of their time and their best abilities to the consideration of the affairs of the Company. It was not a mere ornamental Board; it was composed of real working men, who had had large experience. Of course, he did not wish to say too much in praise of his colleagues, as all worked together; but he did want the proprietors, if the Directors made mistakes in future—and everybody made mistakes—to believe that they were acting to the best of their ability. They had a difficult task, they had not the management of one Company, but of two Companies. They had international susceptibilities to consider. They had also other susceptibilities—the political susceptibilities, the individual susceptibilities of a large staff of engineers, and the still more difficult matter of meeting the labour question, which affected every country in the whole civilized world. Taking these facts into consideration, and looking back at the past, and seeing the number of rocks of which they had to steer clear, his wonder was not that they had succeeded as they had done, but that their misfortunes had not been greater than they had been. It was true the clouds had broken away, and there was a slight light shining through. They could, however, only hope that the storm period of the last three years would not be renewed, and that the Board would have the proprietors' support if they were renewed in the future, as they had had their support in the past.

LECTURE ON "GAS MANUFACTURE" AT READING.

Inauguration of the New Offices.

By invitation of the Chairman (Mr. J. Okey Taylor) and Directors of the Reading Gas Company, a large and representative gathering of the townspeople last Wednesday assembled in the new offices of the Company in Friar Street—a detailed description of which appeared in the "JOURNAL" for the 12th inst., p. 744—to make an inspection of these splendid new premises and later on attend a lecture on "Coal-Gas Manufacture," given by Mr. James W. Helps, M.Inst.C.E., the Engineer and Manager of the Croydon Gas Company. The guests were received by the Chairman of the Company and several of the Directors, with whom were Mr. Douglas H. Helps and Mr. A. Canning Williams, the Engineer and Secretary respectively.

Before the lecture commenced, the visitors were busily occupied, and appeared much impressed, by a detailed examination of the many examples of gas heating and cooking stoves on show, as also styles of burners and fittings innumerable—all working to perfection under the efficient staff of assistants whom Mr. Helps has secured for the purpose. An extensive collection of coal-tar products also excited considerable interest and comment.

Tea and coffee having been served in the new Board-Room—a comfortable apartment, the walls of which are covered with a number of portraits of past and present Directors—the guests assembled in the Lecture Room, which comfortably held the 70 or 80 gentlemen present. In the unavoidable absence of Mr. Okey Taylor from this part of the evening's engagement, the chair should have been occupied by Dr. J. B. Hurry, who has taken with Mr. Helps a deep interest in making the arrangements for the lecture. Dr. Hurry was, however, unable to be present owing to ill-health; and Mr. T. E. Hewett, another member of the Board, presided.

In a few opening remarks, the Chairman mentioned that gas was first supplied to the town of Reading in 1819, in which year the original Reading Gas Company was formed. In 1862, there were two Companies; and these amalgamated under the title of the Reading Gas Company, which was incorporated under an Act giving capital powers to the extent of £40,000. The capital in use at the present time had, however, increased to £300,000, which showed an advance of 900 per cent. upon forty years ago. Last year the amount of gas sold by the Company was 480 million cubic feet. Mr. Hewett then introduced Mr. Helps, who, he said, was thoroughly conversant with the manufacture and distribution of coal gas and particularly fitted for the task he had kindly undertaken to perform.

Mr. Helps at once proceeded with his lecture, which was couched in popular language, and avoided as far as possible the use of technical words and phrases. His diction and style of delivery were pleasing throughout; and the series of photographic lantern views of gas-works plant and machinery, which were exhibited pretty well continuously throughout the evening, proved a particularly interesting adjunct to the lecture itself.

At the close of the proceedings, a hearty vote of thanks to the lecturer was proposed by Dr. Price, who referred to the public spirit of the Gas Company in arranging for the series of lectures of which this was the first. He added that if the other lectures were of the same extremely high standard as the one which they had just enjoyed, the Company would never lack a numerous and intelligent audience. Mr. C. G. Field seconded the resolution, which was carried unanimously, and Mr. Helps replied.

Corporation Gas-Fitting at Southport.—Mr. Boyd, it seems, does not approve of the Southport Corporation Gas Committee doing fitting work for private customers; and he told the Council that the Committee's men had been employed on a Saturday afternoon, while the gas-fitters in the town had not had enough work to keep their men employed full time. He inquired if the Corporation workmen were paid the trade wages. To this Alderman Travis replied that the men engaged by the Committee were as well paid year in and year out as those of any other employers. While men very seldom left the Corporation, they had a constant number of applications for work.

Consumption by Gas-Cookers at Oldham.—In answer to a question put by a member of the Oldham Gas Committee as to whether or not the cookers lent out by the Corporation were paying by increasing the consumption of gas, the General Manager (Mr. Andrew) stated that he was having the consumption looked up for each house where the cookers had been installed. Where there was not a sufficient quantity of gas consumed, they were sending a notice stating that the cooker was not being employed to the Committee's satisfaction, and that unless made more use of, it would be brought away. He wanted a minimum increase of 5000 cubic feet a year where a cooker was now used. Several had already been brought away.

GAS COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 807.

Issue.	Share.	When ex Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.
590,000	10	Oct. 13	10½	Alliance & Dublin 10 p.c.	20½—21½	..	4 17 8
160,000	10	,,	7½	Do. 7 p.c.	14⅝—15⅝	..	4 16 9
200,000	5	Nov. 15	7	Bombay, Ltd.. . . .	6¾—7¼	..	4 16 7
40,000	5	,,	7	Do. New, £4 paid	5—5½	..	5 1 10
50,000	10	Aug. 31	14	Bourne- 10 p.c. . .	29—30	..	4 13 4
51,810	10	,,	7	mouth Gas B 7 p.c. .	17—18	..	3 17 9
53,200	10	,,	6	and Water Pref. 6 p.c.	15½—16½	..	3 12 9
380,000	Stk.	Aug. 16	12½	Brentford Consolidated	258—263	..	4 15 1
300,000	,,	,,	9⅜	Do. New . . .	197—202	..	4 14 1
50,000	,,	,,	5	Do. 5 p.c. Pref. .	125—130	..	3 16 11
206,250	,,	Dec. 14	4	Do. 4 p.c. Deb. .	101—104*	..	3 16 11
220,000	Stk.	Sept 15	11¼	Brighton & Hove Orig.	220—225	..	5 0 0
246,320	,,	,,	8¼	Do. A. Ord. Stk. .	160—165	..	5 0 0
460,000	20	Sept. 28	10	British	42½—43½	..	4 11 11
100,000	Stk.	Aug. 16	6	Bromley, Ord. 5 p.c. .	120—123	..	4 17 7
165,700	,,	,,	4½	Do. do. 3½ p.c. .	90—93	..	4 16 9
500,000	10	Oct. 13	7	Buenos Ayres (New) Ltd.	12½—12¾	..	5 9 10
250,000	Stk.	June 29	4	Do. 4 p.c. Deb. .	96—98	..	4 1 8
150,000	20	July 13	8½	Cagliari, Ltd.	24—20	..	6 6 11
100,000	10	Sept. 28	10	Cape Town & Dis., Ltd.	17—17½	..	5 14 3
100,000	10	Oct. 27	4½	Do. 4½ p.c Pref.. .	10—10½	..	4 5 9
50,000	50	Nov. 2	6	Do. 6 p.c. 1st Mort.	52—54	..	5 11 1
50,000	Stk.	June 29	4½	Do. 4½ p.c. Deb. Stk.	102—104	..	4 6 7
1,434,680	Stk.	Aug. 31	5⅛	Commercial 4 p.c Stk. .	116—118	..	4 8 1
560,000	,,	,,	5	Do. 3½ p.c. do. .	112—114	..	4 7 9
450,000	,,	Dec. 14	3	Do. 3 p.c. Deb. Stk.	84—86*	..	3 9 9
800,000	Stk.	,,	6½	Continental Union, Ltd.	125—128*	..	5 1 7
200,000	,,	,,	7	Do. 7 p c Pref.	143—148*	+1½	4 14 7
424,070	Stk.	—	5½	Derby Con. Stk. . . .	125—127	..	4 6 8
55,000	,,	June 3	4	Do. Deb. Stk. . . .	108—110	..	3 12 9
486,090	10	July 28	11	European, Ltd. . . .	22—23	..	4 15 8
354,060	10	,,	11	Do. £7 10s. paid	15—16	..	5 3 2
15,223,235	Stk.	Aug. 16	4⅛	Gas- 4 p.c. Ord. . .	102½—103½	+1	4 5 0
2,600,000	,,	,,	3½	light 3½ p.c. max. . .	89—91	..	3 16 11
3,799,735	,,	,,	4	and 4 p.c. Con. Pref.	110—113	+½	3 10 10
4,193,975	,,	Dec. 14	3	Coke 3 p.c Con. Deb.	86—88*	+1	3 8 2
258,740	Stk.	Sept. 15	5	Hastings & St. L. 3½ p.c.	98—101	..	4 19 0
70,000	10	Oct. 13	11	Hongkong & China, Ltd.	19½—20½	..	5 7 4
3,800,000	Stk.	Nov. 15	10	Imperial Continental .	232—235	−1½	4 5 1
473,600	Stk.	Aug. 16	3½	Do. 3½ p.c. Deb. Red.	96—98	..	3 11 5
175,242	Stk.	Aug. 31	6	Lea Bridge Ord. 5 p.c. .	123—128	..	4 13 9
561,000	Stk.	Aug. 16	10	Liverpool United A . .	234—236	..	4 4 9
718,100	,,	,,	7	Do. do. B . .	172—174	..	4 0 6

Issue.	Share.	When ex Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.
306,083	Stk.	June 29	4	L'rpool Unit'd Deb. Stk.	111—113	..	3 10 10
75,000	5	Dec. 14	5	Malta & Medn., Ltd. .	4¼—4¾*	..	5 5 3
560,000	100	Oct. 2	5	Met. of 5 p.c. Deb..	100—102	..	4 18 0
250,000	100	,,	4½	Melbourne 4½ p.c. Deb.	100—102	..	4 8 3
541,920	20	Nov. 15	3½	Monte Video, Ltd. . .	11½—12½	..	5 12 0
1,565,892	Stk.	July 29	4⅝	Newc'tle & G'tesh'd Con.	107—109	+½	4 4 10
406,025	Stk.	June 29	3½	Do. 3½ p.c. Deb.	100—102	..	3 8 8
15,000	10	Aug. 31	10	North Middlesex 10 p.c.	18½—19½	..	5 2 7
52,940	10	,,	7	Do. 7 p.c.	13—14	..	5 0 0
300,000	Stk.	Nov. 30	8	Oriental, Ltd. . . .	147—150*	..	5 6 8
600,000	5	Sept. 14	7	Ottoman, Ltd. . . .	6—6½	..	5 7 8
168,255	Stk.	—	6½	Plym'th & St'house 5 p.c.	—	..	—
398,490	5	Apl. 28	6	Primitiva Ord.	7—7½	..	4 0 0
796,980	5	July 28	5	Do. 5 p.c. Pref. .	5⅝—5⅞	..	4 13 0
488,900	100	Dec. 1	4	Do. 4 p.c. Deb. .	97—99*	..	4 0 10
851,070	10	Oct. 13	7	River Plate Ord. . . .	12¾—13¼	..	5 5 8
300,000	Stk.	June 29	4	Do. 4 p.c. Deb. .	96—98	..	4 1 8
250,000	10	Sept. 28	7	San Paulo, Ltd. . . .	13—13⅜	..	5 3 8
70,000	50	July 1	5	Do. 5 p.c. Deb. .	51—53	..	4 14 4
135,000	Stk.	Sept. 14	10	Sheffield A	244—246	..	4 1 4
209,984	,,	,,	10	Do. B	244—246	..	4 1 4
523,498	,,	,,	10	Do. C	244—246	..	4 1 4
126,106	Stk.	Aug. 31	5½	Shrewsbury Ord. 5 p.c.	110—120	..	4 11 8
70,000	10	Sept. 28	10	South African	15½—16½	..	6 1 3
6,250,000	Stk.	Aug. 16	5½	South Met., 4 p.c. Ord.	132—134	..	4 2 1
1,895,445	,,	July 13	3	Do. 3 p.c. Deb.	87—89	..	3 7 5
575,000	Stk.	Aug. 16	5½	S'th Suburb'n Ord. 5 p.c.	123—126	..	4 7 4
60,000	,,	,,	5	Do. 5 p.c. Pref. . .	125—130	..	3 16 11
112,533	,,	July 13	5	Do. 5 p.c. Deb. Stk.	132—137	..	3 13 0
502,310	Stk.	Nov. 15	5	Southampton Ord. . .	109—112	..	4 9 3
87,950	,,	—	4	Do. 4 p.c. Deb.	—	..	—
120,000	Stk.	Aug. 31	6½	Tottenham A 5 p.c. .	125—128	..	4 17 8
363,020	,,	,,	4½	and B 3½ p.c. .	99—102	..	4 13 2
125,000	,,	Dec. 14	4	Edmonton 4 p.c. Deb.	105—107*	−½	3 14 9
182,380	10	June 15	8	Tuscan, Ltd.	9¾—10¼	..	7 16 1
149,900	10	July 1	5	Do. 5 p.c. Deb. Red.	100—102	..	4 18 0
30,000	Stk.	Aug. 16	7½	Wands- A 5 p.c. . .	—	..	—
255,636	,,	,,	6¼	worth B 3½ p.c. . .	137—140	..	4 9 3
60,000	,,	,,	5⅛	and C 3½ p.c. . .	113—116	..	4 13 6
57,564	,,	June 29	3	Putney 3 p.c. Deb. Stk.	82—85	..	3 10 7
745,872	,,	Aug. 16	5	West Ham 5 p.c. Ord. .	106—108	..	4 12 7
185,000	,,	,,	5	Do. 5 p.c. Pref. . .	123—126	..	3 19 4
193,300	,,	June 29	4	Do. 4 p.c. Deb. Stk.	104—109	..	3 13 5

Prices marked * are "Ex. div."

PROPOSED REMOVAL OF SULPHUR RESTRICTIONS.

Movement for a Conference of Local Authorities.

At the Meeting of the Reading Town Council last Thursday, attention was called to the notice given by certain gas companies, including that at Reading, of their intention to promote a Bill next session for the removal of the existing statutory restrictions as to the quantity of, and liability for excess of, sulphur compounds (other than sulphuretted hydrogen) contained in the gas supplied by them. The Town Clerk (Mr. W. S. Clutterbuck) explained the object of the Bill, and said the Analyst for Shropshire (Mr. T. P. Blunt) had expressed the opinion that the restrictions should not be removed, and that Dr. Ashby (the Medical Officer of Health for Reading) had prepared a report on the subject, in the course of which he said: "The evidence which has been given as to the effect of burning coal gas containing much sulphur in houses is conflicting; but I think it is undesirable that gas should be permitted to contain an unrestricted quantity of sulphur, especially as gas undertakings are now doing all they can to push the use of gas as fuel for heating and for cooking-stoves with penny-in-the-slot meters, which are generally placed in small houses in very improper situations, with no means of exit for the products of combustion. Sulphur acids arising from the combustion of fuel are among the most objectionable constituents of fogs; so that if, as is anticipated, gas is to be much more generally used as fuel for heating and cooking in future, I am of opinion that the sulphur in it should be reduced to the lowest practicable quantity. At present a much larger proportion of these acids in the atmosphere is derived from the combustion of coal and coke; but this will be lessened as the use of gas fuel becomes more general. Indeed, it is being strongly urged that the most promising solution of the smoke abatement difficulty lies in this direction." The Town Clerk went on to say that there were a large number of local authorities who were interested in the matter, and were affected by the notice referred to. It appeared to him that the best course they could adopt would be to have a joint conference on the subject; and if they thought necessary to oppose the Bill, they could recommend this course to the several authorities. Alderman Martin, as Chairman of the Finance and General Purposes Committee, moved that the Town Clerk be directed to communicate with the several other local authorities affected, with a view to arrangements being made for a conference on the subject to take place at an early date. He said no doubt the matter before the Council deserved very great consideration; and he supposed that there were two sides to this question, as to most others. In the report of the Public Analyst for Shropshire, already referred to, he said: "I am of opinion that any attempt by the gas companies to obtain a removal of the restrictions as regards the quantity of sulphur, ought to meet with uncompromising opposition in the public interest. Whatever damage is done by the burning of gas is due almost entirely to the sulphur it contains. . . . It is clear, therefore, that if any action is taken by Parliament, it should be rather in the direction of further restriction than of greater laxity in the limit of sulphur in gas to be used as a domestic illuminant or a source of heat." Alderman Martin said he believed there was on the previous evening a meeting of their very energetic Gas Company in Reading, and had he been able to be present he would probably have heard the other side of the question. At all events, all he asked the Council to do was to send three representatives to the conference to discuss the merits of the proposed Bill, and take such action as might be deemed necessary. Alderman Poulton seconded the proposition, which was carried *nem. con.*

PRICE OF GAS AT NANTWICH.

Mr. D. Davies, the Gas Manager to the Nantwich Urban District Council, states that he has been the victim of a great deal of "chaff" regarding the large profit made on the first year's working of the undertaking since its acquisition from the Company. Many consumers, it seems, are under the impression that the high price of gas is alone responsible for this gratifying result; and "comparisons" which "are odious" have been made between the charges at Nantwich and those at such places as Birmingham and Manchester. Thinking that the members of the Gas Committee might be tackled in a similar way, Mr. Davies has thoughtfully provided them with a table giving the costs in six large towns, taken from their returns for the years 1904 to 1905, compared with the results at Nantwich. From these records, he says, the Committee will see at a glance how it is that their undertaking has been able to pay its way, though its burdens are five times greater than the average of the six large towns taken as examples. Had the capital charge on the undertaking been in the same ratio as the average of these towns, the Nantwich works would have been, owing to the extremely low cost of manufacture, in a position to supply gas at 1s. 11d. per 1000 cubic feet, instead of 3s. 2d. to 3s. 9d., which are the present prices. For every 1000 cubic feet of gas sold in Nantwich, 2s. 5·11d. is absorbed in paying interest and sinking fund charges, which is alone more than most large towns charge for gas. This item of expenditure explains, he says, why the price of gas in Nantwich must necessarily be higher than in Manchester and some other places. He feels that the Committee will agree with him in saying that, instead of gas consumers complaining of the high price charged, they ought to feel most thankful they have escaped paying an additional rate of at least 7d. in the pound. In commenting upon the returns, Mr. Davies remarks that the average cost of gas delivered to the consumer in the six towns referred to is 1s. 8·74d. per 1000 cubic feet. In Nantwich the cost is 1s. 3·36d.; showing a saving of 5·36d. per 1000 cubic feet. If the cost in Nantwich had been the same as the average of the six towns, the gross profits would have been reduced by £777, and the rates would have been called upon to provide a sum of £503.

The Council have shown their appreciation of Mr. Davies's services by increasing his salary from £150 to £200 per annum.

CARRON

New Gas Fires

Have all the good features which go to form your ideal—and a few more. All the burners are fitted with attachment, which allows the fires to be regulated *in situ* to suit varying pressures, and where water gas is used perfect combustion is ensured.

The burners can be removed for cleaning purposes, and the bricks may be replaced without trouble by hand.

Supplied in 8 colours of Majolica, Porcelain Enamel, and in Bronze and Armour Bright Finishes.

New Gas Fire Lists with your name on free.

CARRON COMPANY.

Works: CARRON, STIRLINGSHIRE.

Agencies and Show-Rooms in all Large Towns.

THE "BALMORAL" FIRE.

FITTED WITH HOT AIR CHAMBERS AT BACK.

No.	Over-all Sizes.			Width of Fire.
	Height.	Width.	Height to Top of Flue.	
	ins.	ins.	ins.	ins.
527	29	18	21	12

LIGHTING OF TWEEDMOUTH AND SPITTAL.

Incandescent Gas Supersedes Electric Lighting.

At the Meeting of the Berwick Town Council last Tuesday, a report from the Lighting Committee and a return by the Borough Surveyor on the subject of the lighting of Tweedmouth and Spittal were presented. The former contained an interesting comparison of the cost of gas and electric light. Taking gas alone, in the three years ending March 31, 1902-3-4, it cost, for Berwick only, £533, £546, and £496. The cost of lighting the town with gas and electricity combined for one year ending Sept. 30 last, was £706; showing an increase of £181 on an average of three years for gas lighting alone. The Lighting Committee had before them on the 4th inst. the tenders of the Gas Company and of the Electric Supply Company for the lighting of Tweedmouth and Spittal, when a motion to accept that of the former Company was negatived in favour of an amendment to submit the tenders to the Council. The return presented by the Borough Surveyor set forth that he had examined the three tenders of the Electric Supply Company—the first for the complete lighting of Berwick, Tweedmouth, and Spittal, the second for lighting the two last-named places, and the third for lighting their principal streets. The second tender was, he said, the only one which could be compared with that of the Gas Company for the complete lighting of Tweedmouth and Spittal. He submitted an analysis of the tenders, the totals of which were: Gas Company, £288 10s. 6d.; Electric Light Company, £357. On the matter coming before the Council, Mr. Greenwood moved that the tender of the Gas Company, which provided for the use of incandescent gas-light, should be accepted; pointing out that by doing this they would effect a saving of £68. Alderman Marshall remarked that the members were all agreed that the Council would get the best and cheapest light from the Gas Company. In the result, their tender was accepted.

METROPOLITAN WATER BOARD.

At a Special Meeting of the Board held on Thursday—Sir R. M. Beachcroft in the chair—the Law and Parliamentary Committee submitted for approval the Bill to sanction the carrying out of important works in the Lea Valley to which reference was made in the notice of the proposed legislation for next session which appeared in the "JOURNAL" for the 28th ult. (p. 626). The seal of the Board was ordered to be affixed to the petition for the Bill. The Works and Stores Committee reported that tenders had been received for the completion of the covered reservoir at Honor Oak. Altogether 39 tenders were sent in—the amounts ranging from £229,480 down to £129,444; and that of Messrs. J. Moran and Son, of Westminster, was accepted, for £136,561. The Board approved of the course taken by the Committee. The Appeal and Assessment Committee presented a report in regard to the quinquennial valuation of the Board's property. They reviewed their previous proceedings in this matter, and expressed regret to find that the differences between the Board's valuation and that fixed in respect of the Board's property in certain of the Metropolitan Boroughs were such that they were advised that there was no hope of arriving at a settlement with the Assessment Committees concerned. In these circumstances, they had given instructions for appeals to Quarter Sessions to be lodged on the Board's behalf. The Boroughs affected were: Chelsea, Deptford, Finsbury, Greenwich, Hampstead, Holborn, Islington, Kensington, St. Marylebone, St. Pancras, Woolwich (excluding Eltham), and the City of London. The Committee stated that they had given instructions for the services of three independent engineering witnesses to be retained on the Board's behalf, and had had forwarded an estimate of the sum of £1000 to the Finance Committee for submission to the Board on account of additional expenses which might be incurred as a result of the litigation. They thought that it was a matter of regret that expenditure of this kind should have been necessary, considering that both parties represented the ratepayers; but at the same time it appeared to the Committee that the Board had done everything that was possible in their endeavour to arrive at an agreement on the subject with the various Local Authorities, and, in their opinion, they were to be congratulated on having arrived at a settlement in many cases. They recommended that the estimate of £1000 should be approved, and that they should be authorized to incur the expenditure in connection with the quinquennial valuation of the Board's property. Mr. Pickersgill moved, as an amendment, that the recommendation should be referred back. The amendment, however, was lost, and the recommendation was adopted, with an instruction to the Committee to report further at the next meeting of the Board, to be held on Feb. 2, 1906.

PROPOSED PURCHASE OF CREWKERNE WATER-WORKS.

It has been decided by the Crewkerne Urban District Council to take the necessary legal steps for the acquisition of the Water Company's undertaking. Mr. H. Gould, who brought the matter before the Council, said that the late Lord Portman, from whom the Water Company obtained the lease of the water rights, was in favour of the water undertaking being in the hands of the Local Authority. The Company, however, informed Lord Portman that their object was the welfare of Crewkerne, rather than the making of a large profit; and they expressed the hope that his Lordship would consider the matter from this point of view, and not as if the Company speculated with the view of making large profits. The Company had, however, Mr. Gould remarked, paid 6 per cent. since 1890, except last year, when it was 5½ per cent; and they had increased the price of water. In these

DON'T CONFUSE the New Gas Industry
(Wright's "ST. ANDREW" Boom)
with the ordinary Gas Fire Trade.

This is a **different**
trade **altogether.**
It is a **fresh**
trade **altogether.**

And

It is going to mean
Business—***no mean business***—**FOR YOU**
If you put the
"St. Andrew" on SIMPLE HIRE.

JOHN WRIGHT'S,
The Gas Steam
Radiator People.

negotiations with the Company, the Council had offered to pay for the undertaking a sum equal to 10 per cent. on the paid-up capital, together with the amount necessary to make the dividend 6 per cent. since the formation of the Company, and between £200 and £250 in addition. This offer was, however, refused. He had no wish to rob the shareholders of a single farthing to which they were entitled; but he thought the Company might acquiesce in referring the matter of the price to arbitration. The Chairman (Mr. W. C. Lye), in supporting the proposal, said he had always been of opinion that the town would never acquire the water-works without going to Parliament for powers. It was strange that the Company were now making cottagers pay a water-rate which they had not been asked to pay before. He thought the reason was that the Company anticipated being forced to sell their works, and so they sought to increase the revenue in order to make the shares more valuable. A Committee was formed to give effect to the resolution.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

The treatment which the report by Mr. John F. Simmance, of London, upon lighting questions in Edinburgh, is receiving at the hands of the Town Council, is suggestive of the feeling that some who were chiefly instrumental in procuring it are now disposed to think that they had better have left the subject alone. The report—which appears on page 810—was obtained at the instance of a section of the Town Council who for months had prated about there being something wrong with the gas supply. If it was not their main purpose to lay their hands upon an authoritative statement which would support them in their condemnation of the supply, it was at least their hope that they would get something which would quite justify them in the attitude they had taken up. Mr. Simmance has not given them that comfort. He has found that what is wrong is not the gas, but the manner of using it; and he is especially severe on the methods of public lighting. The Committee into whose hands the report has fallen are consequently at a loss to know what to do. Their attitude suggests a casting about for some way of escape from an awkward situation. There has been unaccountable delay in getting the report into print, and even in issuing it after it is in print. On Tuesday last, for instance, the Cleaning and Lighting Committee had the report before them, and the statement officially communicated to the Press regarding it was that: "There was no discussion on the report, as it was generally felt that Mr. Mackay, the Inspector of Lighting, should be afforded the opportunity of making a statement with reference to some of the strictures of Mr. Simmance; and, with this object, the matter was re-committed to the Sub-Committee who had originally charge of it. A deputation of the Committee, accompanied by Mr. Mackay, the Inspector, and Mr. Stevenson, Convener of the Electric Lighting Committee, afterwards left for Glasgow, for the purpose of inspecting a new scheme for the electric lighting of common stairs, and seeing how far it could be made applicable to some districts in Edinburgh." More delay still, with, apparently, a hurried visit to Glasgow, to see if something could be picked up which would enable the Inspector of Lighting to frame a reply to Mr. Simmance, and the Committee to get out of the difficulty they are in. When the report will come before the Town Council for consideration we do not know. Even when it does, there are opportunities for re-committal which must not be forgotten; so that it may be a long time before we come to the end of the matter.

At the Denny Town Council on Tuesday, Mr. Lochhead asked permission to reply to remarks made by Mr. Sawers at the October meeting of the Council, regarding the gas undertaking. Mr. Lochhead recalled that Mr. Sawers brought forward a motion to the effect that "it be remitted to the Gas Committee to consider whether the yield of gas per ton of coal carbonized was satisfactory, and, if not, what was the reason for the deficiency;" and he went on to say that Mr. Sawers departed from his motion, and went into the financial working of the gas-works, and compared Denny with Kilsyth, which, he said, "were both purchased by the respective Town Councils about the same time." They would naturally infer from this statement that both works started, from that stage, under equal conditions in every respect, and therefore had equal opportunities for improvement and development; but this was not the case, and his (Mr. Lochhead's) contention was that it would be difficult, if not impossible, to find two works of similar size commencing operations under more unequal conditions. To prove this, he would take two items of expenditure common to both, to show how the unequal relation originated, and how it had since developed, and its effect on the cost of production. The purchase price at Denny was £5744, and that at Kilsyth £1500, which made Denny £4244 more than Kilsyth. In both cases the money was borrowed for forty years, at 4 per cent. interest, which meant that Denny paid £4710 annually in capital and interest, while Kilsyth paid only £1230, which was a difference in favour of Kilsyth of £3480 a year for forty years. Then Denny had paid £3794 for a new gasholder; while Kilsyth paid only £1200—a difference in favour of Kilsyth of £2594. Denny paid, in interest alone, £2527; while Kilsyth paid only £507—a difference of £2020. Upon the two items of the gas-works purchase and the new gasholder, Denny had been called upon to pay £16,776, against Kilsyth's £4437—a difference of £12,339. Looking to these figures, it was a moral impossibility for any gas manager or gas committee to counteract the effect which this had upon the cost of production. The charge upon gas sold was, in Denny, 10·28d. per 1000 cubic feet, and in Kilsyth it was 1·51d.—a difference of 8·77d. Unfortunately for them, their works were over-capitalized. Figures showing the capital undertakings of various works about the same size as Denny, and with a similar output, would illustrate the point better than anything else. These were: Innerleithen, £3300; Kilwinning, £3500; Darvel, £4000; Haddington, £4000; Anstruther, £5000; Fraserburgh, £6000; Forres, £6480: Kilmalcolm, £7579; Dunbar, £8400; and Denny,

CARBURETTED WATER-GAS APPARATUS

Merrifield—Westcott—Pearson Patents.

The Economical Gas Apparatus Construction Co., Ld.

W. H. PEARSON, Chairman.
W. H. PEARSON, Junr., Deputy-Chairman.
J. T. WESTCOTT, Manager.
L. L. MERRIFIELD, M.Inst.M.E., Engineer.

London Offices: 19, ABINGDON STREET, WESTMINSTER, S.W.
American Offices: TORONTO. TELEGRAPHIC ADDRESS: "CARBURETED, LONDON."

CARBURETTED WATER-GAS ENGINEERS.

The above Company have erected since 1893, or are now erecting, their Universal Type of Carburetted Water-Gas Plant at the following Gas-Works:—

	Cub. Ft. Daily.		Cub. Ft. Daily.		Cub. Ft. Daily
BLACKBURN	1,250,000	ST. CATHERINES (Remodelled)	250,000	TONBRIDGE	300,000
WINDSOR ST. WORKS, BIRMINGHAM	2,000,000	KINGSTON, PA.	125,000	STRETFORD	500,000
SALTLEY WORKS, BIRMINGHAM	2,000,000	PETERBOROUGH, ONT.	250,000	OLDBURY	300,000
COLCHESTER	300,000	WILKESBARRE, PA.	750,000	TODMORDEN	500,000
BIRKENHEAD	2,250,000	ST. CATHERINES (2nd Cont.)	250,000	SALTLEY, BIRMINGHAM (Third Contract)	2,000,000
SWINDON (New Swindon Gas Co.)	120,000	BUFFALO, N.Y.	2,000,000	YORK (Second Contract)	750,000
SALTLEY, BIRMINGHAM (Second Contract)	2,000,000	WINNIPEG, MAN.	500,000	ROCHESTER (Second Contract)	500,000
WINDSOR ST., BIRMINGHAM (Second Contract)	2,000,000	COLCHESTER (Second Contract)	300,000	NEWPORT (MON.)	250,000
HALIFAX	1,000,000	YORK	750,000	TOKIO, JAPAN	1,000,000
TORONTO	250,000	ROCHESTER	500,000	PERNAMBUCO (Brazil)	125,000
OTTAWA	250,000	KINGSTON, ONT.	300,000	MALTON	150,000
LINDSAY (Remodelled)	125,000	CRYSTAL PALACE DISTRICT	2,000,000	DULUTH, MINN. (2nd Cont.)	300,000
MONTREAL	500,000	DULUTH, MINN.	300,000	BROCKVILLE (ONT.)	250,000
TORONTO (Second Contract Remodelled)	2,000,000	CATERHAM	150,000	SMETHWICK	500,000
BELLEVILLE	250,000	LEICESTER	2,000,000	GRAVESEND	300,000
OTTAWA (Second Contract)	250,000	ENSCHEDE (HOLLAND)	150,000	NEWPORT MON. (Second Contract)	250,000
BANTFORD (Remodelled)	200,000	BUENOS AYRES (RIVER PLATE CO.)	700,000	TORONTO (Third Contract)	750,000
		BURNLEY	1,500,000	TORONTO (Fourth Contract)	1,000,000
		KINGSTON-ON-THAMES	1,750,000	MONTREAL, ONT. (2nd Cont.	1,800,000
		ACCRINGTON	500,000	HAMILTON, ONT.	400,000

LEEDS, 1,800,000 C. Ft. LEICESTER (2nd Cont.), 1,000,000 C. Ft. NEWCASTLE-ON-TYNE, 1,800,000 C. Ft.

AND, IN ADDITION, 8,150,000 CUBIC FEET DAILY; also Coal-Gas Plants at NELSON, B.C., CHATHAM, BERLIN, NAPANEE, OWEN SOUND, CALGARY, and WINNIPEG.

£12,211. Mr. Lochhead went into figures very elaborately, in support of his contention that they were severely handicapped in Denny. Mr. Sawers said he did not know what Mr. Lochhead was to say, and that he would take his own time in replying; but Provost Hunter said the matter was at an end, and would not be brought up again.

The Gas Committee reported to the Hamilton Town Council on Tuesday that the Municipal Employees' Association had written complaining that the work of the stokers in the Corporation Gas-Works was far heavier than in other gas-works, as from 4 to 4½ cwt. of coal per retort were carbonized, instead of from 3 to 3½ cwt.; and that the Manager—Mr. J. Ballantyne—had reported to the Committee that the average per mouthpiece was about 3⅝ cwt. He had written to the Association to this effect; and the Town Clerk was instructed by the Committee to send a similar reply.

The question of the extra charge for gas consumed through prepayment meters was before the Wishaw Town Council on Monday. The extra charge is 7d. per 1000 cubic feet. The Gas Committee reported that they had found, on comparing the charge with that which was made by other corporations, that in Wishaw they were considerably under the average; and they recommended that, in the meantime, no alteration be made. This was agreed to. The Gas Manager—Mr. P. B. Watson—was instructed, if any consumer wished to exchange a prepayment for an ordinary meter, if he were a yearly tenant and a suitable person, to grant the exchange, provided the cost of making the exchange was paid at the time.

On the evening of Monday last, Mr. Henry O'Connor, Assoc.M. Inst.C.E., of Edinburgh, read a paper on "High-Power Gas Lighting" before the Royal Scottish Society of Arts, in Edinburgh. The first part of the paper was not new to those who had heard Mr. O'Connor previously; but it was necessary for the introduction of his subject. He began by detailing the composition of coal gas, and the different theories of illumination advanced by various scientists, an acquaintance with which led to improvements in gas-burners. In speaking of lighting effect, he said he objected to the central gaselier, so commonly used for home lighting, and stated his preference for side brackets, with lights of small power. He illustrated, by means of a slide, the amount of light thrown in various directions by different lights. He described the inverted incandescent gas-burner, and urged the necessity there is for governing the pressure of the gas—not the reduction of it, as in the case of the flat-flame burner, but the keeping of it even. He emphasized the advantage of light walls and ceilings for the diffusion of light; and explained the methods which have been adopted, with success, in the lighting of large spaces. Some points about bunsen burners were mentioned, as well as the theories respecting the great radiation of light from mantles impregnated with rare earths. A number of recently invented gas burners for giving high-power light were described, and also shown in action, among them being the Lune light, the Humphrey, and the Lucas self-intensifying lights, and the Keith and Sale and Onslow systems of high-pressure lighting. A very neat model apparatus was shown, to illustrate the latter system, in which the pressure of the gas is raised to 40 or 50 inches by mechanical means, and a highly-intensified light is the result. This method, he said, had been largely adopted in Woolwich Arsenal, for the lighting of the various workshops, and elsewhere. As is usual, Mr. O'Connor's paper was discussed by the Association. Mr. F. G. Baily, M.A., the Professor of Electricity and Magnetism in the Heriot-Watt College, Edinburgh, said he could not agree with everything Mr. O'Connor had said, principally as to the comparison of the costs of gas and electricity and the extra lighting power obtained from gas as against electricity. Mr. Somers, of the Corporation Gas Department, gave some of his experiences both with high-power lights and inverted burners, and as to the strength of the mantles of inverted burners when subjected to severe vibrations. Mr. Proctor also spoke as to the life of mantles. Dr. George H. Gemmell, F.C.S., also took part in the discussion, which was throughout highly favourable to gas lighting. Mr. O'Connor was cordially thanked for his interesting paper.

A month ago, I mentioned that the Town Council of Langholm proposed, on account of a difference regarding the charge for gas for public lighting, to charge the Gas Company with wayleave for their gas-mains. On Thursday of this week, at a meeting of the Town Council, a letter from the Gas Company was read, in which they stated that they would agree to light the Town Hall buildings and the Town Hall free, but that they were prepared to defend any action which the Council might take regarding wayleave.

Last night, the annual *soirée* and concert of the Granton Gas-Works Sick Benefit Yearly Society was held in Picardy Place Hall, Edinburgh. Mr. W. R. Herring, the Chief Engineer and Manager of the Gas Commissioners, who presided, said that the Society was in a very healthy condition. The membership was over 400; but he was sorry to learn that all their men were not in the Society. He urged them all to join, pointing out the benefits to be derived by them from membership of the Society.

The Leeds Gas Workers and the Six-Day Week.—Speaking at a meeting held under the auspices of the Leeds Branch of the National Union of Gas Workers, Mr. J. G. Smith (the District Secretary), referring to the dispute regarding Sunday work, said he was convinced that all through their negotiations with the Gas Committee the men's attitude had been the correct one. They had striven to secure a week of six working days, in the belief that this system would be a saving to the ratepayers, and a means of finding employment for more men. The workers had been spoken of as greedy; and those who made this assertion said its truth was borne out by the men not accepting the Committee's suggestion. They did not want seven days work a week; and they realized that the Corporation's claim to help the unemployed was a bogey. He hoped the days of strikes had gone by; but if there was any trouble, the gas workers would be found as staunch and as ready as in 1890 to fight in defence of their rights.

STILL ANOTHER DEVELOPMENT.

THE WILSON "SHERATON"

WITH S.M. VENTILATORS.

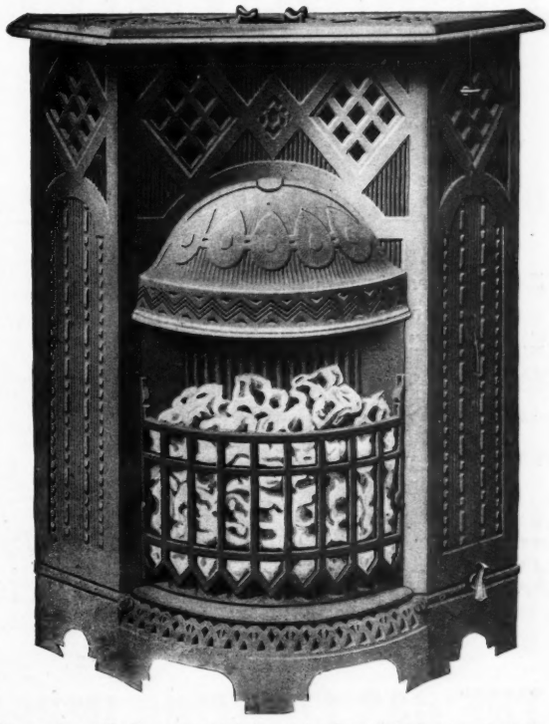
In addition to the New Gas Fire, in which both Gas and Air are adjusted without removing the Burner, and whilst Gas is burning, and the Fuel adapted to Flame as scientifically as Mantle to flame of Incandescent Light,

This Stove can be fitted with an arrangement for Ventilating the room.

When a Gas Heating Stove is fixed in front of a fireplace the ventilation of the room is interfered with, but in the **"Sheraton"** with S.M. VENTILATORS the ventilation is under control.

The two perforated spaces above the Canopy are fitted with Hit-and-Miss Grates and Flue Nozzles carried through the sheet-iron back plate, thus giving two 3-inch tubes which effectively ventilate the room, in addition to the ordinary flue nozzle for taking away the products of combustion.

We gratefully acknowledge that the **S.M.** Ventilating Attachment was suggested to us by the South Metropolitan Gas Company.



Size 20 in. wide by 27 in. high by 4½ in. deep, width of top 22½ in

PRICE, with Boiling Burner and Sheet-Iron Back, **£2 2s. 6d**

S.M. Ventilating Attachment, 4s. 6d. extra.

WILSONS & MATHIESONS, LTD.,

CARLTON WORKS,

ARMLEY, LEEDS.

And 76, QUEEN ST., CHEAPSIDE, LONDON; and PARIS.

CURRENT SALES OF GAS PRODUCTS.

Week ending Dec. 16.

The London market for tar products has been quite without incident during the week, which is not surprising at this time of the year. Makers are, however, well sold; and the following prices show firmness. Sixties crude carbolic is still 1s. 9½d. net; 39-40 per cent. crystal carbolic acid is strong at 6d. per lb., with very small stocks; and 90 per cent. benzol has again been done at 10½d. net. Best solvent and toluol are both firm, especially the latter. Pitch is in particularly good demand for prompt delivery; the price required in this market being from 35s. 6d. to 36s. net per ton. Sulphate of ammonia continues to be rather disappointing, production and consumption just for the time appearing to be fairly balanced. The price quoted ranges from £12 15s. to £12 17s. 6d. per ton, on Beckton terms, according to the period of delivery.

LIVERPOOL, *Dec.* 16.

Sulphate of Ammonia.

Weakness has been the prevailing tone in the market, and prices still tend downwards. There has again been a fair amount of buying; but supplies have become more abundant, and makers have only been able to effect sales by making concessions in prices. The closing quotations are £12 5s. per ton f.o.b. Hull, £12 7s. 6d. per ton f.o.b. Liverpool, and £12 10s. per ton f.o.b. Leith. No important first-hand forward business has transpired; but orders for delivery over the spring months continue to be taken abroad, speculatively, at the equivalent of about £12 12s. 6d. per ton f.o.b. U.K. ports, and for near months at less than the £12 12s. 6d. equivalent.

Nitrate of Soda.

This article is quiet in all positions; and although spot prices are maintained at 10s. 9d. to 11s. per cwt., according to quality, spring is being offered at a discount on these prices.

LONDON, *Dec.* 16.

Tar Products.

Business has been very quiet during the past week, except in carbolic acid, for which the market remains firm, and a fairly large business has been done in 60's at 1s. 9½d. at outports for December shipment; while 1s. 10d. is reported to have been paid for January-June f.o.b. London. 75's are still being sold freely for home consumption; but foreign consumers still decline to take this quality, and continue to give the preference to 60's. Crystals are still very quiet, and makers are now quite prepared to accept 6d. for 39-40 per cent.; but there is scarcely any inquiry even at this price. In benzol, 90 per cent. is hardly so firm as was the case a little while ago, although it is reported that one of the principal London refiners declined 10d. for January-March. There are, however, sellers in the North of England at rather low prices, especially for forward delivery. In 50-90 per cent., the position remains unchanged, and there is really nothing offering, though there is still a fairly good inquiry from the Continent. A small sale in toluol is reported to have been made at 1s. per gallon for early delivery; but as regards forward makers do not care to accept the prices offered by buyers, as there seems to be an idea among distillers that there may be a scarcity of this article a little later on. The London market for creosote is still very quiet, and there are one or two parcels offering at under the prices asked by the largest makers. In Yorkshire, the market is decidedly firm, and manufacturers decline to accept 1⅛d. per gallon in any position. The position in Lancashire has also improved, and there is nothing of any importance offering just at present. Manufacturers are evidently now much easier as regards stocks; and it is difficult to fix the exact value, as very much depends upon the quality of the oil, but 1⅛d. appears to have been paid at makers' works in more than one instance. It is quite impossible to fix the actual value of pitch, as sales are reported in some instances at very low prices; while as against this, some of the larger manufacturers remain very firm in their ideas. Some of the London makers still quote 34s. 6d. to 35s. But it is absolutely impossible to obtain these prices; and it is generally believed that 33s. 6d. would be accepted for a fair quantity for January-June delivery. There is now an inquiry in the market for shipment to Japan, which may improve matters for the time being; but, undoubtedly, the production of briquettes during the present year will be very much under the output for 1904. In Yorkshire, there is really very little offering, though here again sales of small quantities are reported at very low prices. The largest manufacturers are still reported to be asking 33s. 6d., and even 34s.; but it seems pretty evident that less than these figures have been accepted by the smaller producers. In South Wales, there is still an inquiry for January-June; but the prices offered by consumers are so very low that business has not yet resulted. It would seem, however, as if there were anxious sellers in one or two quarters, and it is probable that dealers may meet consumers' views before the end of the year.

The average values during the week were: Tar, 18s. to 22s.; Pitch, London, 33s. 6d. to 34s.; east coast, 32s. 6d. to 33s. 6d.; west coast, 31s. to 32s. Benzol, 90 per cent., 10d.; 50-90 per cent. 10¼d. to 10½d. Toluol, 11¼d. to 11½d. Crude naphtha, 4d.; solvent naphtha, 11½d. to 1s. 1d.; heavy naphtha, 11½d. to 1s. Creosote, London, 1⅛d.; North, 1⅛d. to 1⅛d. Heavy oils, 2¼d. Carbolic acid, 60 per cent., 1s. 9¼d. to 1s. 9½d. Refined naphthalene, £4 to £8 10s.; salts 18s. 6d. to 21s. 6d. Anthracene, "A" quality, 1½d. to 1⅝d.; "B" quality, unsaleable.

Sulphate of Ammonia.

The market is decidedly quiet, but there is a fairly good demand for forward delivery. As regards London, neither Beckton nor the South Metropolitan are anxious to sell for early delivery; and they maintain their ideas for January-June at £12 17s. 6d. and £12 16s. 3d.

THE

MAXIM PATENT CARBURETTOR

FOR ENRICHING GAS IN BULK.

PREVENTS NAPHTHALENE DEPOSITS.

OVER **120** MAXIM PATENT CARBURETTORS HAVE NOW BEEN FIXED.

Among the Companies and Towns supplied are The Gaslight and Coke Company, Manchester, Exeter, Birmingham, Leeds, Rochdale, Bristol, Sheffield, Oldham, Dundee, Perth, Dunfermline, and many other Works, both large and small, where they have been working in some instances for the past **Ten Years.**

MORE GAS & SALEABLE COKE PER TON of COAL CARBONIZED is PRODUCED; SAVING CAPITAL, LABOUR, FUEL, WEAR & TEAR, &c.

THE ENRICHMENT IS INSTANTANEOUS AND PERMANENT.

The Carburettor is inexpensive, easily fixed, and entirely supersedes the use of Cannel.

Dealers in Benzol, Carburine, and all other Naphthas and Oils suitable for the Enrichment or Production of Gas.

For Prices and full Particulars, apply to

THE GAS LIGHTING IMPROVEMENT COMPANY, LIMITED,

18, DEVONSHIRE STREET, BISHOPSGATE, LONDON, E.C.

respectively. In Hull, business has again been done at £12 10s. for December; but it is reported that a little less than this was accepted for January-March by one manufacturer. The market value in Leith cannot be taken as anything over £12 10s. for early delivery, though some manufacturers still quote £12 12s. 6d., at which price, however, business is quite impossible. In Liverpool, sales were made early in the week at £12 8s. 9d. to £12 10s.; but lower figures were accepted at the close. It is not to be expected that there will be very much doing from now to the end of the year, as consumers do not appear at all anxious to purchase.

COAL TRADE REPORTS.

Lancashire Coal Trade.

The coal trade of the county continues steady. House qualities are finding a slightly improved demand; but the weather so far is only mild. The cotton and iron trades are, however, in such a prosperous condition, that all classes of engine fuel fetch full current rates, with a trifle more money on new contracts. The working miners seem inclined to magnify the amount of the output and its selling value, and are contemplating an increase of wages in the early months of the New Year. It is very doubtful, however, if they will be able to do more than establish the maintenance of the present terms. The Pemberton colliery strike still continues its melancholy history. From Sheffield it is reported that during the week the demands for house and gas coal have been heavy, especially for common sorts. Prices there, as here, are steady. Quotations for various kinds of coal on the Manchester Coal Exchange show no variation at the pits' mouth from those we published last week.

Northern Coal Trade.

There has been a strong demand for coal during the last few days, which will, in all probability, be increased before the holidays, as users are desirous of stocking for their requirements, and the shippers wish to get cargoes away before then, and thus avoid the delay at such times. Best Northumbrian steams are higher at about 9s. 9d. per ton f.o.b.; second-class steams are from 8s. 6d. to 8s. 9d.; and smalls are from 5s. to 5s. 9d. In the gas coal trade, there is now the fullest pressure of demand, as the two weeks of heaviest consumption are at hand; and though work is full at the gas coal collieries, they are barely able to meet the current needs, though at times these have been to some extent checked by the non-arrival of steamers, owing to the delays through the fog. The price of Durham gas coals varies from about 8s. 6d. to 9s. 3d. per ton f.o.b., according to quality. A contract for next year has been concluded, for the shipping season, at about 9s. per ton f.o.b.; and one or two other small ones are in course of arrangement. The firmness in gas coals has beneficially affected other kinds of Durham coals. Coke is rather firmer; and though gas coke is in heavy production, the tendency seems to be in the direction of better prices, but good gas coke has been quoted at 10s. 6d. to 11s. 6d. f.o.b. on the Newcastle Exchange this week.

Scotch Coal Trade.

Trade continues in a state of activity. There is a large volume of shipping business doing, although the Baltic trade is now almost over for the season. There is also a strong home demand, which is the most hopeful sign of all. It is said, indeed, that the collieries are booked with orders which will carry them over the end of the year, and that there is little current business on hand; the market being nearly altogether of the forward sort. The prices quoted are: Main 7s. 6d. to 7s. 9d. per ton f.o.b. Glasgow, ell 8s. 6d. to 9s. 3d., and splint 9s. 6d. to 10s. The shipments for the week amounted to 242,326 tons—an increase of 6687 tons upon the previous week, and of 15,801 tons upon the corresponding week of last year. For the year to date, the total shipments have been 11,609,862 tons—an increase of 528,033 tons upon 1904.

The New Water-Works of the Loughborough Corporation.—In the "JOURNAL" for the 21st ult., we gave an account of the progress of the new water-works for the Loughborough Corporation. When completed, the reservoir will have a capacity of 506 million gallons; the water area being 8½ acres. By this means the new works will afford a supply of 2 million gallons per day. The price named in the contract for the construction of the dam was £56,707. But the Corporation have had to take the works into their own hands; and £40,000 is required for filter-beds and mains within the added limits of supply. The total cost will therefore be £100,000 in round figures. The Consulting Engineers for the work are Messrs. G. & F. W. Hodson, MM.Inst.C.E., and Mr. C. E. Robinson, is their Resident Engineer. It is hoped that in the course of a few weeks the storage of water will commence to a depth of 40 feet; and this will hold in reserve 126 million gallons.

Prepayment Meters at Stalybridge.—In appealing to the Stalybridge Town Council on behalf of the prepayment meter consumers for a reduction of price, Mr. Bottomley said it was an injustice that they should have to pay 8d. or 9d. per 1000 feet more than the ordinary consumers. Alderman Wood pointed out that this matter had been thoroughly gone into. The slot-meter consumers had to pay more because of the hire of the meter and the extra cost of collection. Mr. Cook said the Gas Committee could afford to reduce the price if they would not spend so much on putting fittings and pendants into property which the owner ought to pay for. Alderman Simpson thought this an extraordinary statement, which ought not to remain unchallenged. He never knew that the Committee provided fittings for any houses. Alderman Keefe said they had provided fittings for his property. The Mayor said it was entirely the fault of the people themselves if there was anything wrong with the gas-meter system. It was quite optional whether they used prepayment or ordinary meters. Mr. Bottomley, however, retorted that it was the fault of the property owners who put these meters in.

INCLINED RETORTS.

NEW WORK
1906.

Now is the time to get Particulars of our Patent Inclined Retort-Bench, which costs about **20 per cent. less** than the old design and is equally effective. We can arrange to work it in your existing House without raising the Roof.

WRITE FOR ESTIMATES.

12 YEARS' Experience in actual building of Benches.

16 YEARS' in Manufacture of Conveyors and Elevators for same.

33 CONTRACTS COMPLETED.

Also Designers of every kind of Transport Appliance for Gas-Works.

SPECIALITIES:

ARCHD. LITTLE'S
PATENT
Measure Chamber,
Coke Carrier,
Coke Conveyor,
Coal Conveyor,
Inclined Retorts,
AND
W. T. HOLLAND'S
Grit-Proof Bearings.

No Gas-Works is complete unless the above are in use.

NEW CONVEYOR Co., LTD., SMETHWICK.

Cheaper Gas for Power Purposes at Mansfield.

At the last Monthly Meeting of the Mansfield Town Council, the Gas Committee recommended that the following charges should come into force from the 1st prox.: Consumers of 50,000 cubic feet per quarter, 2s. per 1000 feet; consumers of under 50,000 cubic feet per quarter, 2s. 2d. Alderman Blake, in proposing the adoption of the recommendation, said the Gas Committee had had the question of the reduction of the price of gas for power and manufacturing purposes under consideration for some time. They had been most anxious to keep the price up and make a good profit; but the time had now arrived when the Committee were compelled to recommend a considerable reduction. They, however, felt they could not do this until they had made a substantial reduction to users of slot-meters. They must do this, otherwise the manufacturers would be putting down their own plant to make gas for power purposes. It was very desirable they should retain the custom of consumers for power, because they took a large quantity. It might be said that they could not afford this reduction, which to a certain extent might be true. They must bear in mind that they had to pay a big amount every year in the sinking fund and the payment of interest—close upon £4000—but he thought they would be unwise to look at the matter from this point of view. After some discussion, the recommendation was adopted.

The New Water Scheme for Bacup.

A Special Meeting of the Bacup Town Council was held on Tuesday evening with reference to the promotion of the Bill of which notice had been given. Mr. J. H. Hoyle, the Deputy-Mayor, said the principal object of the measure was to make provision for the completion of the new water-works in the Cowpe Valley. A further loan was required under unforeseen circumstances. The discovery of faults and bad ground in making the trenches necessitated going to a depth of 190 feet, where, according to Professor Boyd Dawkins, 50 feet was expected to be ample to get a good foundation. The extra depth and the consequent filling in of the trench with concrete was responsible for an additional outlay of about £25,000. Beyond this, a further £25,000 was required for land and easements, £10,000 for the new filters and service reservoir, and £15,000 for new mains in the town and filters which might ultimately be needed; making a total of £75,000 for water-works purposes. It was expected that a term of 60 years would be granted for repayment. The Bill also made provision for increasing the charges for water, should it be found necessary to do so. It was not proposed to raise the charges outside the borough. An extension by three years was asked for the completion of the Cowpe scheme. He formally moved that the Bill be promoted; and the motion was carried by 18 votes to 2.

Effect of Birmingham Welsh Water on Galvanized Ware.

The Birmingham Health Committee have found it necessary to issue warnings with regard to the utensils in which it is sought to boil the Welsh water now being supplied to the city; and they recommend the use of enamelled or tinned ware for this purpose. No complaint is, of course, made as to the purity of the water; but at present there are on sale articles known as "galvanized Welsh water kettles," to which the Medical Officer of Health (Dr. Robertson) has had his attention drawn. On making an investigation, he found that any pure soft water acts on the coating of these kettles with great vigour, and dissolves so much of the zinc from the galvanizing as to make the water harmful and objectionable. The Committee regard this matter as of serious importance from the point of view of the public health; and at their last meeting they passed a resolution approving of two circulars which the Medical Officer of Health has been instructed to publish. The first is to be sent to manufacturers, asking them to call in any of the kettles they have manufactured or distributed, with a view of preventing the sale of them within the city; and the second is to be handed to ironmongers and others who distribute the kettles, informing them that water boiled in them for any time becomes so highly charged with zinc as to be dangerous, and requesting them not to sell any kettles with a galvanized zinc coating. No objection is made to any other kind of kettle.

Water-Works Extensions at Wolverhampton.

When moving the adoption by the Wolverhampton Town Council of a report dealing with proposed supplemental works, Alderman J. Mander, the Chairman of the Water Committee, said it was with diffidence that he asked the Council to sanction the expenditure of so large a sum as £90,000; but the matter was urgent. The question was before the Council as far back as November, 1900, and applications were made to Parliament in 1901 and 1902; but on both occasions the Bills were thrown out. Negotiations had been entered into with the Staffordshire and Worcestershire Canal Company; and for the privilege of sinking to the depth required, the Corporation had to pay £5000, together with certain costs. With the consent of the local Council, the Committee had bored at Tettenhall; and he was pleased to say they had found a good supply of water, which it was estimated would yield 1½ million gallons per 24 hours. He believed this increased supply would carry the Council forward for 15 to 20 years. Among the works proposed were the laying of another pumping-main from Tettenhall to Goldthorn Hill, with trunk mains into the town; the construction of a supplemental reservoir at Tettenhall, a storage tank at Essington, and the erection of six cottages at Cosford. The Committee had also decided, when applying to the Local Government Board for sanction to a loan, to include £15,000 to cover capital cost which might be incurred in extending the ordinary service-mains during the next ten years. He moved that the supplemental works proposed be carried out, and that application be made to the Local Government Board for their sanction to the borrowing of £90,000 to cover the cost. After some discussion, this was agreed to.

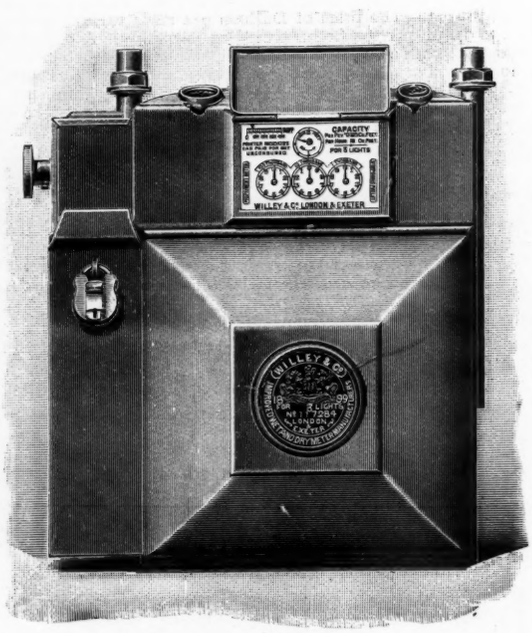
THREE POINTS

of advantage from the many found in our Slot Meters are:

1st.—They are Fraud Proof, and Cannot be tampered with through the Slot.

2nd.—The Slot is closed when the maximum number of Coins have been inserted.

3rd.—Our Price-Changing System is the Simplest, Quickest, and most Accurate yet devised.



ALL PARTS INTERCHANGEABLE.

Tens of Thousands in use, and adopted exclusively by many Gas Companies.

WILLEY & CO., LTD., LONDON & EXETER.

AGENTS FOR SCOTLAND:
D. M. NELSON & CO., 53, WATERLOO STREET, GLASGOW.

Mr. R. Watson on the Measurement of Illumination.

At a recent meeting of the Doncaster Scientific Society, Mr. R. Watson, the Gas Engineer and Manager to the Corporation, gave a very interesting lecture on the above-named subject, and demonstrated how measurement of the different powers of illuminants is obtained. He traced the improvements in lighting that had been effected from pieces of wood, torches, and candles, to the incandescent gas and electric arc lights of the present day; and illustrated on the blackboard the methods of testing where the spermaceti candle is used as the standard. This, he explained, was the English standard, from which we derived the terms 16, 30, &c., candle power. In France, the carcel —a colza lamp equal to about 9⅓ candles—was the standard. The pentane lamp, equal to 10 English candles, was almost invariably accurate; and the test could be performed in a much shorter time than with the English sperm candle. This was the method in use at Doncaster. The different photometrical systems, physical, chemical, and electric, used or suggested, were described. The portion of the lecture dealing with illumination effect was also fully treated.

A Shipley Compensation Water Arbitration.

Last Wednesday, at Bradford, Mr. Henry Rofe, as Umpire, conducted an inquiry in reference to the statutory obligations of the Shipley Urban District Council as to the supply of compensation water from their water-works. It was alleged by Mr. Bentley Wrigglesworth, owner of the Baildon Bridge Mills, that the Council had failed to comply with the provisions of the Shipley Water and Police Act, 1854, as to the discharge of water from the compensation reservoir at Eldwick. Evidence was given by Mr. C. H. Gott, Mr. Charles Gott, and Mr. Wrigglesworth, to show that during the past summer the compensation reservoir had been practically empty, and that little or no water had been sent down, though the Act required a daily discharge of 332,000 gallons. The witnesses for the Council were Mr. H. A. Johnson and Mr. Walter Middleton, who gave evidence that, although there were short periods in the summer months when a full supply of water had not been sent down from the reservoir, the supply had been made up from other sources which the Council were entitled to impound, but which they had allowed to run free into the river. The Umpire will consider his award.

Fog and Gas Consumption in Manchester.—Last Tuesday was a very foggy day in Manchester; and the consumption of gas reached 28,810,000 cubic feet—a record output for the Department. Last year, on Dec. 21, 26,819,000 cubic feet were consumed; and this figure held the lead until last week. More could have been consumed in the days just before last Christmas; but the plant was inadequate. Since then, however, alterations have been carried out at the Gaythorn works, which enable the Committee to meet any demand that is likely to be made upon them.

Incandescent Gas Lighting in the City of London.—At the meeting of the Court of Common Council of the City of London last Thursday, the Streets Committee reported, with reference to the incandescent gas lighting in Fleet Street, that they had erected new lamp-columns, at an additional cost of £142 12s. 6d.; it being found impossible to use the old standards. Certain incandescent gas-lamps are to be connected to the high-pressure mains, in lieu of the existing compressing apparatus, at an estimated outlay of £100. The City of London Electric Lighting Company are to be required to remove their lamp upon the footway of Cheapside by the General Post Office entrance, this being unnecessary in consequence of the light given by the gas-lamps in St. Martin's-le-Grand being sufficient.

Heavy Sentences for Slot-Meter Robberies.—At the Staffordshire Assizes, before Mr. C. F. Vachell, K.C., sitting as a Commissioner, James Moran, a labourer, was found guilty of breaking into a house at Hanley, and stealing 8s., the property of the British Gaslight Company, from a slot meter. No evidence was offered on several other indictments against the prisoner. Moran had been committed for theft and burglary at several places. Mr. Vachell criticized the offence of slot-meter robberies as being a terror to poor householders, and committed prisoner to twelve months' imprisonment. A similar term of imprisonment (to be followed by two years' police supervision) was awarded by Mr. Justice Bucknill, at the Warwickshire Assizes, to two men—named Jordan and Millichamp—who were indicted for thefts from gas-meters at Ashton. There were previous convictions against the pair; and it was said they were associates of a gang of thieves of this class.

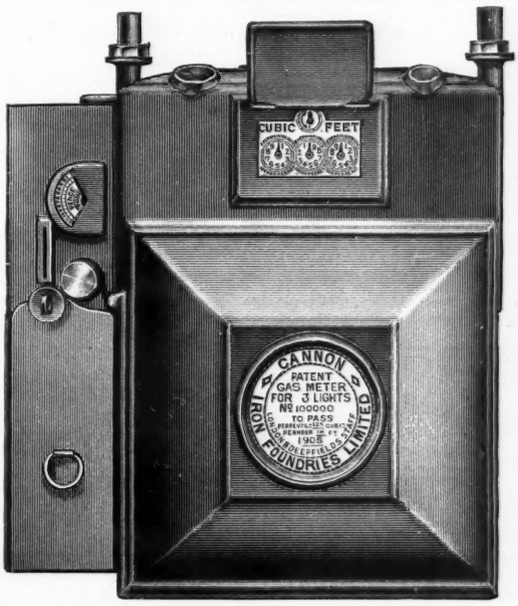
The annual dinner of the West Greenwich Gas-Works Institute was held on Saturday—Mr. J. F. Braidwood, the President, being in the chair. After the loyal toasts, the Chairman proposed "The South Metropolitan Gas-Works," whose Chairman (Sir George Livesey) and Board of Directors, he said, were always ready to study the interest and welfare of the men in their employ. They had tangible evidence of this in the grand system of co-partnership. Everything possible was done by the Board to make the men comfortable, as the provision of the Institute proved. Mr. H. Austin, one of the Workmen Directors, in reply, said that they were ever ready to benefit their employees. During the eleven years he had been on the Board, he had never heard one jarring note against anything which was brought forward for the good of the men, and every suggestion had been carried unanimously. Three weeks ago Sir George Livesey signed a transfer upon which the figures £27,000 appeared; and this was to be allotted in the way of shares to the employees. He (Mr. Austin) was glad to know that West Greenwich was going ahead as a thrifty station. Mr. Godfrey proposed "The Chairman" in flattering terms; and the compliment was suitably acknowledged. On behalf of the Slate Club, Mr. Tracey presented Mr. A. Showell (the Hon. Secretary) with a handsome marble timepiece, in recognition of his indefatigable services.

"CANNON"

PREPAYMENT

GAS METERS

DRY AND WET.



GUARANTEED FOR FIVE YEARS.

PATENTED IMPROVEMENTS.

STRONG.

DURABLE.

RELIABLE.

EVERY VARIETY OF GAS METER SUPPLIED.

Ask for our Illustrated List, free on application.

CANNON IRON FOUNDRIES, Ld.,

Deepfields, near Bilston, Staffs.

London Office and Show-Rooms:

Bath House, 57-60, Holborn Viaduct, E.C.

On the occasion of the annual dinner of the officers and staff of the Portsea Island Gas Company on Monday last week, at which the Engineer and General Manager (Mr. J. D. Ashworth) presided, a pleasant incident was the presentation by him of a handsome tea service to Mr. T. Christopher, one of the collectors, who is retiring after 42 years' service.

The London and General Power Supply Company, Limited, has been registered with a capital of £60,000, in £10 shares, to carry on the business of generators, transmitters, distributers, and suppliers of electrical energy for any purposes, constructors and equippers of generating stations and electric light and power works, layers of cables and wires, &c., and to apply for any necessary Acts of Parliament or Provisional Orders.

Tear-off date calendars with quotations from the poets and general authors have for some time been before the public; but we have not seen one with a better selection than that issued by Simon-Carvés, Limited, of Manchester, one of which we have received, as in previous years. The figures (which are bold) and quotations are printed in chocolate ink; and the date-block is mounted on a stout cream-coloured card with the firm's name in gilt letters.

The British, Foreign, and Colonial Automatic Light-Controlling Company, Limited, has been formed with a capital of £100,000, in £1 shares, to acquire as a going concern, as from the 30th of November, the goodwill of the business of the Automatic Light-Controlling Company, Limited, and in particular the entire British, Foreign, and Colonial patents and rights in respect of Mr. John Gunning's inventions for lighting and extinguishing all descriptions of gas-lamps and for improvements in apparatus for opening and closing electric circuits, at predetermined times.

A few evenings ago, Bridlington was left in comparative darkness through an accident having occurred at the municipal electricity works.

Messrs. Thomas Piggott and Co., Limited, of Spring Hill, Birmingham, have just successfully completed in South Wales two steel chimneys, one 175 feet and the other 125 feet high.

The Directors of the European Gas Company, Limited, have decided to pay, on Feb. 1 next, the usual interim dividend of 8s. per share on the £10 fully-paid shares, and 6s. per share on the £10 shares, £7 10s. paid.

The Kitson Light Foreign Supply Company point out, in reference to the equipment of the lighthouses by the Trinity House authorities with the new incandescent oil-lamps, that the system employed is the Kitson; a licence having been granted to the Trinity House authorities by the owners of the Kitson patents in Great Britain.

We have received from Messrs. Hazell, Watson, and Viney, Limited, "Hazell's Annual" for 1906. As this useful book of reference has now reached its 21st year of publication, its scope and character are too well known to need detailed explanation. The policy of the proprietors has always been to give the fullest possible information on the men and topics of the day; and their intentions have been well carried out by the Editor, Mr. W. Palmer, B.A. (Lond.) The subjects, which are arranged in alphabetical order, include notices of the reports of the Royal Commissions on Coal Supplies and London Traffic; and among the other new features will be found an article on labour co-partnership, which gives the South Metropolitan Gas Company the credit of being the largest co-partnership development through an ordinary company. The contents include, it is believed, every topic of current interest. They have been revised up to the 2nd inst.; and a guide to them is furnished by a full index.

WANTED, FOR SALE, CONTRACT, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Situations Vacant.

MANAGER. Ilfracombe Gas Company. Applications by Dec. 27.
ASSISTANT ENGINEER. Stockport Gas Department. Tenders by Jan. 3.
ASSISTANT GAS ENGINEER AND MANAGER. No. 4523.
RENTAL AND GENERAL CLERK. Bexhill Water and Gas Company.

Plant (Second-hand) for Sale.

MOUTHPIECES. Exeter Gas-Works.

Tank Waggons Wanted. No. 4522.

Stocks and Shares.

SOUTH METROPOLITAN GAS COMPANY.
YORK UNITED GASLIGHT COMPANY. Jan. 15.

TENDERS FOR

Coal.

COPENHAGEN LIGHTING DEPARTMENT. Tenders by Jan. 15.

Fire-Clay Goods.

MANCHESTER GAS DEPARTMENT. Tenders by Jan. 5.

Iron and Steel Work.

MANCHESTER GAS DEPARTMENT. Tenders by Jan. 5.

Lead and Steel Goods, &c.

SLOUGH GAS COMPANY. Tenders by Dec. 26.

Pipes and Specials.

EXMOUTH GAS COMPANY. Tenders by Dec. 22.
SLOUGH GAS COMPANY. Tenders by Dec. 26.

Purifiers, &c.

MANCHESTER GAS DEPARTMENT. Tenders by Jan. 5.

Tar and Liquor.

ALDERSHOT GAS AND WATER COMPANY. Tenders by Dec. 29.
BRIDGEWATER COLLIERIES. Tenders by Dec. 27.
ENFIELD GAS COMPANY. Tenders by Jan. 1.
HARWICH GAS AND COKE COMPANY. Tenders by Jan. 6.

NOTICES TO CORRESPONDENTS, ADVERTISERS, AND SUBSCRIBERS.

No notice can be taken of anonymous communications. Whatever is intended for insertion in the "JOURNAL" must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.

CHRISTMAS HOLIDAY.

In consequence of the CHRISTMAS HOLIDAYS, it will be a convenience if Communications for the next issue of the "JOURNAL" and Orders respecting ADVERTISEMENTS are received at the Office SOME TIME ON FRIDAY.

Wanted, For Sale, and Tender Advertisements, Six Lines and under, 3s.; each additional Line, 6d.

TERMS OF SUBSCRIPTION to the "JOURNAL."

United Kingdom: One Year, 21s.; Half Year, 10s. 6d.; Quarter, 6s. 6d.
Payable in Advance. If credit is taken, the charge is 25s. a year.

Abroad (in the Postal Union): £1 7s. 6d., payable in Advance.

All Communications, Remittances, &c., to be addressed to WALTER KING, 11, BOLT COURT, FLEET STREET, LONDON, E.C.
Telegrams: "GASKING, LONDON." Telephone: P.O. 1571a Central.

OXIDE OF IRON.

O'NEILL'S OXIDE
For GAS PURIFICATION.
LARGEST SALE OF ANY OXIDE.

SPENT OXIDE PURCHASED IN ANY DISTRICT.

GAS PURIFICATION & CHEMICAL CO., LD.
PALMERSTON HOUSE,
OLD BROAD STREET, LONDON, E.C.

WINKELMANN'S
"VOLCANIC" FIRE CEMENT.
Resists 4500° Fahr. Best for GAS-WORKS.
ANDREW STEPHENSON, 182, Palmerston House, Old Broad Street, London, E.C. "Volcanism, London."

PATENTS AND TRADE MARKS
PUBLICATIONS, "MERCHANDISE MARKS ACT, and Decisions thereunder," 1s.; "TRADE SECRETS v. PATENTS," 6d.; "DOCTRINE of EQUIVALENTS, Mechanical and Chemical," 6d.; SUBJECT-MATTER of PATENTS," 6d.
MEWBURN, ELLIS, & PRYOR, Chartered Patent Agents, 70 and 72, Chancery Lane, London, W.C. Telegrams: "Patent London." Telephone: No. 243 Holborn.

BROTHERTON & CO., LIMITED.
Offices: Commercial Buildings, LEEDS.
Correspondence invited.

J. & J. BRADDOCK (Branch of Meters Limited), Globe Meter Works, OLDHAM, and 54 & 47, Westminster Bridge Road, LONDON, S.E.
WET AND DRY GAS-METERS, PREPAYMENT METERS, STATION METERS, AND GOVERNORS.
REPAIRS RECEIVE PROMPT ATTENTION.
Telephones: 254 Oldham, and 2412 HOP, London.
Telegrams:—
"BRADDOCK, OLDHAM," and "METRIQUE, LONDON."

DUTCH OXIDE OF IRON.

SPENT OXIDE PURCHASED IN ANY DISTRICT.

THE First Dutch Bogore Co., Ltd., HOLLAND.
General Manager (for England and Wales)—
CHARLES E. FRY, LEAMINGTON.
General Manager (for Scotland)—
J. B. MACDERMOTT, 11, Bothwell St., GLASGOW.

GLASS SHADES of every description, for all kinds of Interior **GAS LIGHTING.**
Illustrated sheets on application.
JOHN WALSH WALSH,
SOHO AND VESTA GLASS WORKS, BIRMINGHAM.
Telegrams: "VESTA, BIRMINGHAM."
National Telephone: No. 63.
London Show-Room: 4, HOLBORN CIRCUS, E.C.

TAR AND LIQUOR WANTED.
Best Prices paid.
DENT AND CO.,
Ouse Chemical Works, SELBY.

OXIDE OF IRON.
(NATURAL.)

BALE & CHURCH will be pleased to send Quotations and Samples on application.
SPENT OXIDE PURCHASED.
BALE'S FIRE CEMENT for all Retort and Furnace work.
PAINT for Gasholders, Purifiers, &c.
5, CROOKED LANE, LONDON, E.C.

SULPHURIC ACID.

SPECIALLY prepared for the Manu- facture of SULPHATE OF AMMONIA
SPENCER, CHAPMAN, & MESSEL, LTD.
(with which is amalgamated WM. PEARCE & SONS, LTD.),
36, Mark Lane, LONDON, E.C. Works: SILVERTOWN.
Telegrams: "HYDROCHLORIC, LONDON."
Telephone: 341, AVENUE.

GAS TAR wanted.
BROTHERTON AND CO., LTD., Tar Distillers.
Works: BIRMINGHAM, GLASGOW, LEEDS, LIVERPOOL, AND WAKEFIELD.

SPENT OXIDE.

THE South Metropolitan Gas Company are always open to receive OFFERS of SPENT OXIDE.
Chief Office: 709, Old Kent Road, London, S.E.
Telegrams: "METROGAS, LONDON."

ROBERT DEMPSTER & SONS, Ltd., Contractors for Complete CARBONIZING PLANTS and every description of GAS APPARATUS and ELEVATING and CONVEYING PLANT, Rose Mount Iron-Works, Elland.

SULPHURIC ACID for Sale, specially suitable for making Sulphate of Ammonia.
Brotherton and Co., Ltd., Chemical Manufacturers, Works: Birmingham, Leeds, and Wakefield

SULPHATE OF AMMONIA SATURATORS and all LEAD and TIMBER WORK in Connection with Sulphate Plants.
We guarantee promptness, with efficiency for Repairs.
Joseph Taylor and Co., Central Plumbing Works, Bolton.
Telegrams: Saturators, Bolton. Telephone 0848.

HYDRATED OXIDE OF IRON.
PREPARED from Pure Iron.
Twice as Rich as Bog Ore.
Gives no Back Pressure.
The Cheapest in the Market.
Can be Exchanged for Spent Oxide.
Read Holliday and Sons, Ltd., Huddersfield.

"NUGEPE" GAS PLANT CEMENT.
JOHN E. WILLIAMS AND CO.,
LOWER MOSS LANE,
MANCHESTER, S.W.
For all Joints in connection with Oil-Gas Plant and Sulphate Plant.
For all Gas Joints.
For all Tar Joints.
For all Ammonia Joints.

TO WATER AND GAS COMPANIES REQUIRING CAPITAL.
THE Water and Gas Debenture Share Investment Trust, Limited, of 37, High Street, Tunbridge Wells, are prepared to Invest £10,000 Capital in above, and also to Underwrite Progressive Water and Gas Companies' issues.

AMMONIACAL Liquor wanted.
Brotherton and Co., Ltd., Ammonia Distillers, Works: Birmingham, Glasgow, Leeds, Liverpool, and Wakefield.

GAZINE—A radical Solvent and Preventative of Naphthalene deposits, which has been used for many years on the Continent for the cleaning of Mains and Services, and is now being adopted in England. It is also used for the Enrichment of Gas, and has an Illuminating Value of double that of 90 per cent. Benzol.
Supplied by C. Bourne, 120, Manor House Road, Newcastle-on-Tyne.

FIRST-CLASS Rental and General Clerk Wanted (Water and Gas). Thoroughly Experienced, Capable, Reliable, and used to booking up Gas-Fittings Accounts (time and material).
Apply, in own handwriting, stating Age, Experience, and Salary required, to R. D. Jesty, Secretary, Bexhill Water and Gas Company, Bexhill-on-Sea.

ASSISTANT ENGINEER AND MANAGER.
A GAS Company making 500 Million cubic feet of Gas per annum invite APPLICATIONS for the position above referred to.
Applications, stating Age, Qualifications, Experience, Salary required, and enclosing *copies* only of Three recent Testimonials (or References) to be sent to No. 4523, care of Mr. King, 11, Bolt Court, Fleet Street, E.C.

COUNTY BOROUGH OF STOCKPORT.
THE Gas Committee invite Applications for the position of ASSISTANT GAS ENGINEER, at a commencing Salary of £120 per Annum, rising, at the discretion of the Committee, to £200 per Annum.
Applications, stating Age, Qualifications, and Experience, with *copies* of not more than Three recent Testimonials, to be addressed to "The Chairman of the Gas Committee," and delivered at this Office on or before Wednesday, the 3rd of January, 1906.
Canvassing will be deemed a disqualification.
Robert Hyde,
Town Clerk.
Town Clerk's Office,
Stockport, Dec. 14, 1905.

ILFRACOMBE GAS COMPANY.
THE above Company invite Applications for the position of MANAGER of their Works.
Annual make of Gas, 50 Millions.
Salary, £200 per Annum.
Applicants must be prepared to enter on the duties at an early date.
Applications to be made only by closed letter, addressed to the Chairman of the Company, and accompanied by not more than Three recent Testimonials, to be delivered at the Company's Offices on or before Dec. 27.
Any further Particulars may be obtained from the undersigned.
C. E. Ball,
Secretary and Manager.
Dec. 13, 1905.

WANTED to Purchase, Gas Carbon delivered at nearest Station to Gas-Works, in quantities of not less than Four Tons.
State Price to No. 4512, care of Mr. King, 11, Bolt Court, Fleet Street, E.C.

WANTED to Hire, Railway Tank WAGGONS for Tar, for Six Months, January to June, 1906.
Address No. 4522, care of Mr. King, 11, Bolt Court, Fleet Street, E.C.

FOR SALE—A quantity of 21-inch by 15-inch Second-Hand Oval MOUTHPIECES, Self-Sealing.
Apply, W. A. Padfield, Engineer, Gas Company, Exeter.

GAS PLANT for Sale—I can always offer NEW and SECOND-HAND GAS APPARATUS, including Retorts and Fittings, Condensers, Exhausters, Scrubbers, Washers, Purifiers, Gasholders, Tanks, Valves, Connections, &c. Also a few COMPLETE WORKS. Compare Prices and Particulars before ordering elsewhere.
J. F. Blakeley, Gas Engineer, Thornhill, Dewsbury.

M. LEVY ON INCANDESCENT GAS LIGHTING.
THE attention of Engineers, Contractors, Manufacturers, and others interested in the use of Gas for Lighting, Heating, and Motive Power, is called to the work on "INCANDESCENT GAS LIGHTING," by M. Paul Levy, C.E., of Paris, which was noticed in the "Journal" on the 21st of November. It is a large volume of 284 pages, with 127 figures and 8 large plates.
Copies may be obtained at the Office of the "Journal," at the Price of 8s. 6d. each, post free.

EXMOUTH GAS COMPANY.
THE Directors of the Exmouth Gas Company invite TENDERS from Founders and others to supply about 40 Tons of 4-inch and 14 Tons of 3-inch Socket and Spigot Cast-Iron MAIN PIPES.
Specification and Conditions may be had on application to the undersigned.
Tenders must be delivered not later than the first post on Friday, the 22nd inst., addressed to the Chairman of the Company, sealed, and endorsed "Tender for Pipes."
The Directors do not bind themselves to accept the lowest or any Tender.
By order,
James T. Foster,
Secretary and Manager.
Exmouth, Dec. 9, 1905.

SLOUGH GAS AND COKE COMPANY.
GAS-MAINS.
TENDERS are invited for the supply of—
107 Tons 15 cwt. of 6-inch Socket and spigot (coated) CAST-IRON PIPES (with grooved sockets), each Pipe to weigh 2 cwt. 1 qr. 21 lbs.
11 Tons 18 cwt. of 4-inch ditto, each Pipe to weigh 1 cwt. 1 qr. 19 lbs.
8 Tons of 3-inch ditto, each Pipe to weigh 1 cwt. 0 qr. 11 lbs.
Also for SPECIALS, LEAD, and YARN.
To be delivered at Langley Station (Great-Western Railway) within One Month from acceptance of Tender.
Any further Particulars may be obtained on application to the Manager of the Works.
Tenders, endorsed "Tender for Mains," to be delivered on or before Tuesday the 26th inst.
By order,
Arthur Thomas,
Secretary.
Offices: 46A, High Street,
Slough, Dec. 7, 1905.

MANCHESTER CORPORATION GAS-WORKS.
THE Gas Committee invite Tenders for the Supply and Delivery of the FIRE-CLAY GOODS required during next season at their several Gas-Works.
Full Particulars and Forms of Tender may be obtained from Mr. C. Nickson, Superintendent, at the Gas Offices, Town Hall, Manchester, on payment of a deposit of Two Guineas, which will be returned on receipt of a *bonâ-fide* Tender.
Sealed Tenders, endorsed "Tender for Fire-Clay Goods," addressed to the Chairman of the Gas Committee, Town Hall, Manchester, are to be delivered at the Gas Offices, Town Hall, not later than Nine a.m. on Friday, the 5th of January, 1906.
The Committee do not bind themselves to accept the lowest or any Tender.
By order,
Wm. Henry Talbot,
Town Clerk.
Town Hall, Manchester,
Dec. 15, 1905.

MANCHESTER CORPORATION.
(Gas Department.)
TO IRON AND STEEL WORK CONTRACTORS.
THE Gas Committee are prepared to receive TENDERS for the IRON and STEEL WORK required in the supply and erection of Four Purifiers, &c., &c., at the Gaythorn Station.
Specification and Bill of Quantities can be obtained from Mr. C. Nickson, Superintendent, Gas Department, Town Hall, on payment of Two Guineas, which will be returned on receipt of a *bonâ-fide* Tender.
Drawings may be seen, and any other Information required may be had, on application to Mr. J. G. Newbigging, M.Inst.C.E., at his Office, Rochdale Road Station.
Sealed Tenders, addressed to the Chairman of the Gas Committee, and endorsed "Tender for Purifiers, Gaythorn Station," must be delivered at the Gas Offices, Town Hall, not later than Nine a.m. on Friday, the 5th of January, 1906.
The Committee do not bind themselves to accept the lowest or any Tender.
Wm. Henry Talbot,
Town Clerk.
Town Hall, Manchester,
Dec. 15, 1905.

ALDERSHOT GAS AND WATER COMPANY.
THE Directors are prepared to receive and consider TENDERS for the purchase of surplus TAR (approximately 1300 Tons) produced at their Gas-Works, Ash Road, Aldershot (private Siding into Works, Tongham Station, L. & S.W.R.), for a Year from Jan. 1 to Dec. 31, 1906.
Specification and Conditions can be obtained on application.
Tenders to be sent in to the undersigned, endorsed "Surplus Tar," to arrive not later than Nine a.m. on Friday, Dec. 29, 1905.
The highest or any Tender not necessarily accepted.
By order,
R. W. Edwards,
Secretary and General Manager.

ENFIELD GAS COMPANY.
THE Directors invite Tenders for the purchase of the surplus TAR to be made at their Works during the Half Year ending the 30th of June, 1906.
Conditions of Contract and Particulars can be obtained of the undersigned, to whom Tenders are to be delivered by Twelve o'clock noon on the 1st of January, 1906.
The Directors do not bind themselves to accept the highest or any Tender.
Chs. W. Offord,
Secretary and General Manager.
Offices, Sydney Road,
Enfield, Dec. 14, 1905.

HARWICH GAS AND COKE COMPANY.
THE Directors of the Harwich Gas and Coke Company invite TENDERS for the purchase of the surplus TAR produced at their Works during the Twelve Months ending Dec. 31, 1906.
The Tar will be delivered free into Contractor's Tanks at the Great Eastern Railway Company's Siding adjoining the Works.
The estimated quantity is about 200 Tons per annum.
Tenders, endorsed "Tenders for Tar," to be addressed to me and delivered not later than the 6th of January next.
The Directors do not bind themselves to accept the highest or any Tender.
Geo. Baines,
Gas-Works, Harwich, Secretary.
Dec. 13, 1905.

TENDERS FOR GAS COAL.
THE Lighting Department of Copenhagen is prepared to receive TENDERS for the supply and delivery of 175,000 Tons of GAS COAL from the beginning of March until the end of December, 1906.
The Lighting Department reserves the right to divide the Contracts between two or more Contractors.
Further Information and Conditions for the delivery may be obtained on application to Direktoeren for Kóbenhavns Belysningsvæsen, Vester Boulevard, 22, Copenhagen, B
The Tenders, sealed and marked "Tilbud paa Kul," to be sent to Direktoeren for Kóbenhavns, Belysningsvæsen, Vester Boulevard, 22, Copenhagen, B., before the 15th of January, 1906, Twelve o'clock, at which time the Tenders will be opened in the presence of the parties tendering who are in attendance.
The Lighting Department of Copenhagen.
Dec. 14, 1905.

BRIDGEWATER COLLIERIES COKE-WORKS.
(The Earl of Ellesmere.)
TENDERS are invited for the Tar produced at the above Works for a period of Six or Twelve Months from the 1st of January, 1906, delivered into Contractor's Tanks at the Bridgewater Colliery Siding, Wharton Hall, on the Pendleton and Hindley Branch of the Lancashire and Yorkshire Railway; or at the Brackley Siding, Little Hulton Mineral Branch of the London and North-Western Railway.
The estimated quantity is about 2600 Tons per annum.
Tenders, endorsed "Tender for Tar," to be addressed to Mr. Thomas M. Brown, Bridgewater Coal Offices, 4, Chapel Walks, Manchester, not later than the 27th of December.
Manchester, Nov. 28, 1905.

HORNSEY GAS COMPANY.
NOTICE is Hereby Given, that the TRANSFER BOOKS of this Company, relating to DEBENTURE STOCK ONLY, WILL BE CLOSED on the 16th inst., and RE-OPENED on the 1st of January, 1906.
By order of the Board,
William E. Roberts,
Secretary.
63, Chancery Lane, W.C.,
Dec. 16, 1905.

THE YORK UNITED GASLIGHT COMPANY.
SALE BY TENDER OF PREFERENCE STOCK
Under the Provisions of The York United Gaslight Company's Act, 1898.
MINIMUM PRICE, £100 PER CENT.
NOTICE is Hereby Given, that, in pursuance of a Resolution passed at a Meeting of the Company specially convened for the purpose, and held on the 3rd day of August, 1905, it is the intention of the Directors to SELL BY TENDER £10,000 PREFERENCE STOCK, entitled to a Maximum Preferential Dividend of £4 per cent. per annum, to be paid up in full on or before the 15th day of February, 1906; being a portion of the Additional Capital authorized to be raised under the above-named Act.
Particulars and Conditions of Tender may be obtained on application at the Gas Company's Office, Davygate, York, or at the York City and County Bank, or any of its Branches; and sealed Tenders, marked "Tender for York Gas Stock," must be lodged with the Gas Company, Davygate, York, or with the York City and County Banking Company, Limited, York, or any of its Branches, not later than Ten o'clock a.m. on Monday, the 15th day of January, 1906.
By order,
Matthew Leaf,
Gas Offices, Davygate, Secretary.
Dec. 15, 1905.

SOUTH METROPOLITAN GAS COMPANY.

NOTICE is Hereby Given, that the Directors of this Company will OFFER the sum of £100,000 ORDINARY STOCK "to all the Gas Consumers and persons in the employ of the Company," pursuant to the provisions of the South Metropolitan Gas Act, 1901.

Full Particulars thereof, together with the Price of such Stock, will be sent to the consumers with the Gas Accounts for the Christmas quarter.

By order,
FRANK BUSH,
Secretary.

Offices: 709, Old Kent Road, S.E.,
Dec. 14, 1905.

ISSUES BY AUCTION OF GAS AND WATER STOCKS AND SHARES.

MR. ALFRED RICHARDS begs to notify that his ISSUES by AUCTION under PARLIAMENTARY POWERS of STOCKS and SHARES in LONDON, SUBURBAN, and PROVINCIAL GAS and WATER COMPANIES take place PERIODICALLY at the Mart, TOKENHOUSE YARD, E.C.

Terms for Issuing such Capital, and also for including Gas and Water Stocks and Shares belonging to Private Owners in these Periodical Sales, can be obtained on application at MR. ALFRED RICHARDS' OFFICES, 18, FINSBURY CIRCUS, E.C.

Now Ready, Price 15s., Limp Cloth.

TWENTY-FIFTH YEAR.

AN

ANALYSIS OF THE ACCOUNTS

OF THE

METROPOLITAN WATER COMPANIES

(Chelsea, East London, Grand Junction, Kent, Lambeth, New River, Southwark and Vauxhall, and West Middlesex),

AND OF THE

ACCOUNTS OF SOME OF THE PRINCIPAL PROVINCIAL WATER UNDERTAKINGS FOR THE YEAR 1904-1905.

Compiled by

WOOD, DREW, & CO.,

Chartered Accountants.

LONDON:
WALTER KING, 11, Bolt Court, FLEET STREET, E.C.

NEWBATTLE CANNEL.

Highest Results in Gas, & Excellent Coke.

QUOTATIONS ON APPLICATION TO

THE LOTHIAN COAL COMPANY,
LIMITED,
NEWBATTLE COLLIERIES,
DALKEITH, N.B.

'BUFFALO' INJECTOR

Operated Entirely by One Handle

Class A lifts 25 ft.
Class B lifts 12 ft.

SEND FOR LIST.

Telegrams: "Temperature London."
Tel. No. 12,455 Central.

GREEN & BOULDING,
— LIMITED, —
28, New Bridge St.,
LONDON, E.C.

THE
"BOYS"
CALORIMETER
for determining the calorific value of gases
IS MADE BY
JOHN J. GRIFFIN & SONS,
— LIMITED, —
Makers of Scientific Apparatus,
KINGSWAY, LONDON, W.C.

HEATHCOTE GAS COAL.

Rich in Illuminating Power and yield of Gas.
Above the Average in Weight and Quality of Coke.
Maintains a High Standard in Residuals.

THE GRASSMOOR CO., LD.,
CHESTERFIELD.

JAMES OAKES & CO.,
ALFRETON IRON-WORKS, DERBYSHIRE,
AND
Wenlock Iron Wharf, 21 & 22, Wharf Road,
CITY ROAD, LONDON, N.

Manufacture and keep in Stock at their Works (also large Stock in London)

PIPES and CONNECTIONS, 1½ to 48 inches in diameter, and make and erect to order RETORTS, PURIFIERS, and TANKS, with or without planed joints, COLUMNS, GIRDERS, SPECIAL CASTINGS, &c., required by Gas, Water, Railway, Telegraph, Chemical, Colliery, and other Companies.

NOTE.—Makers of HORSLEY'S PATENT SYPHONS. These are cast in one piece, without Chaplets; doing away with Bolts, Nuts, and Covers, and rendering Leakage impossible.

THOMAS TURTON AND SONS, LIMITED
SHEAF WORKS, SHEFFIELD,
MANUFACTURERS OF
FILES OF BEST QUALITY
FOR ENGINEERS.
STEEL OF ALL DESCRIPTIONS.
SCREW STOCKS, TAPS AND DIES,
SPANNERS, RATCHET BRACES, LIFTING JACKS
ANVILS, VICES,
AND ENGINEERS' TOOLS GENERALLY.
LONDON OFFICE:
90, CANNON STREET, E.C.

TROTTER, HAINES, & CORBETT
BRETTELL'S ESTATE LIMITED,
FIRE-CLAY & BRICK WORKS,
STOURBRIDGE.

Manufacturers of GAS-RETORTS, GLASSHOUSE FURNACE & BLAST-FURNACE BRICKS, LUMPS, TILES, and every description of FIRE-BRICKS.
Special Lumps, Tiles, and Bricks for Regenerative and Furnace Work.
SHIPMENTS PROMPTLY AND CAREFULLY EXECUTED.

LONDON OFFICE: H. CRESSWELL & CO.,
LEADENHALL CHAMBERS, 4, ST. MARY AXE, E.C.

THOMAS DUXBURY & CO.,
16, DEANSGATE, MANCHESTER.

Best Gas Coal and Cannel, giving High Illuminating Power, Large Yield per ton, and reasonable in Price.
Telegrams: "DARWINIAN, MANCHESTER."
Telephone 1808.

GILBERT LITTLE & CO.LTD.

Conveyor and Elevator Specialists,
Smethwick, Birmingham.
Make known your wants for Conveyors and Elevators to GILBERT LITTLE, the Pioneer Specialist; he will supply them.

MIRFIELD GAS COAL
UNEQUALLED.
Sperm Value 878·85 lbs. per Ton.

Please apply for Prices, Analyses, and Reports, to the

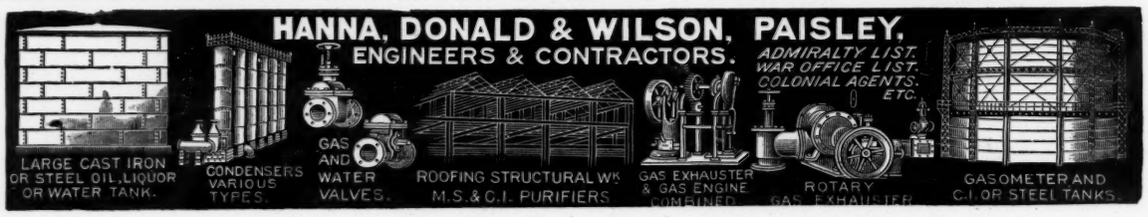
MIRFIELD (GAS COAL) COLLIERIES
RAVENSTHORPE, NEAR DEWSBURY.
LONDON: 22, Park Village East, N.W.

JOHN HALL & CO. OF STOURBRIDGE,
LIMITED,
STOURBRIDGE,
Manufacturers of
FIRE-BRICKS, LUMPS, TILES,
GAS RETORTS,
And every description of Fire-Clay Goods.
RETORTS CAREFULLY PACKED FOR SHIPMENT.

THE
"ROTARY"
STATION METER.
Efficiency
Demonstrated.

APPLY—
T. G. MARSH,
MAWSON CHAMBERS, DEANSGATE
MANCHESTER.

HANNA, DONALD & WILSON, PAISLEY,
ENGINEERS & CONTRACTORS.
ADMIRALTY LIST.
WAR OFFICE LIST.
COLONIAL AGENTS.
ETC.


LARGE CAST IRON OR STEEL OIL, LIQUOR OR WATER TANK.
CONDENSERS VARIOUS TYPES.
GAS AND WATER VALVES.
ROOFING STRUCTURAL WK M.S. & C.I. PURIFIERS
GAS EXHAUSTER & GAS ENGINE COMBINED
ROTARY GAS EXHAUSTER
GASOMETER AND C.I. OR STEEL TANKS.

GAS METERS.
SLOT METERS.
GEYSERS.
COOKERS.
STOVES.
WORKSHOP LAMPS.
GAS IRONS.
IND. GAS APPLIANCES.
FITTINGS.

CENTRAL WORKS in DESSAU
OF THE
GERMAN CONTINENTAL GAS ASSOCIATION
(Deutsche Continental Gas Gesellschaft).
For Illustrated Price Lists and full Particulars apply to our SOLE AGENTS FOR THE UNITED KINGDOM AND COLONIES:
THE INCANDESCENT LIGHTING & MANTLE INSURANCE CO.,
57/58, CHANCERY LANE, LONDON, W.C.
Telephone: 12788 CENTRAL. Telegrams: "FRAENKL, 58, CHANCERY LANE."

GASHOLDER TANKS. BUILDINGS.

THOMAS VALE & SONS, LTD.,
Contractors, **STOURPORT.**
CARBONIZING WORKS.
KLONNE SETTINGS A SPECIALITY. High-Class Work Only.

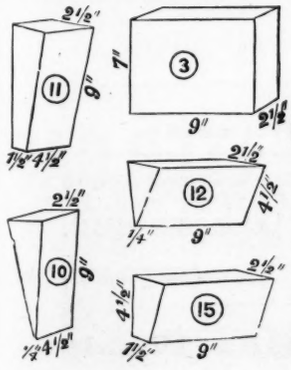
S. S. STOTT & CO.,
ENGINEERS,
HASLINGDEN, nr. MANCHESTER.
LIME & OXIDE ELEVATORS & CONVEYORS.
COAL AND COKE STORAGE PLANTS.
Coal and Coke Elevators and Conveyors.
STAMPED AND RIVETTED STEEL ELEVATOR BUCKETS.
DETACHABLE CHAINS AND SPROCKET WHEELS.
HIGH-CLASS STEAM ENGINES. BEAM PUMPING-ENGINES, &c.

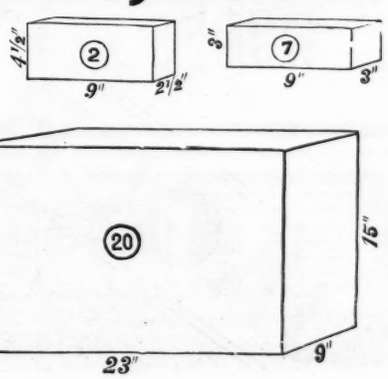
ARROL-FOULIS
Patent Automatic Machinery
FOR
DRAWING AND CHARGING GAS-RETORTS.
Full Particulars may be obtained from the Sole Makers,
SIR WILLIAM ARROL & CO., Limited,
GLASGOW.
[See Illustrated Advertisement, Dec. 5, p. 658.]

BOWENS' Ltd. Successors,
STOURBRIDGE.
MANUFACTURERS OF
BEST FIRE-BRICKS; INCLINED, HORIZONTAL, and SECTIONAL RETORTS; LUMPS, TILES, &c., of every description.
ESTABLISHED 1860.

GAS VERSUS ELECTRICITY.
THE **STAR** Gives 70-Candle Power

With a Consumption of 2½ cub. ft. of Gas per hour, with a 1-inch Mantle.
Each Mantle Ring bears the Reg. No. 427,544.
All Mantles stamped "STAR."
Otherwise none genuine.
BEWARE OF IMITATIONS.
Write for LISTS and DISCOUNTS.
THE 'STAR' INVERTED INCANDESCENT BURNER CO., LTD.,
104-105, GREAT SAFFRON HILL,
FARRINGDON ROAD, E.C.

STEPHENS & CO., KIDWELLY.
Contractors to a large number of the Principal Gas-Works.


SPECIAL IMPROVED
SILICA BRICKS, BLOCKS, SHIELDS, TILES.
SPECIAL PLASTIC SILICA CEMENT.
Without doubt the finest Materials in the Market for Gas-Works Furnaces.
BRICKS, BLOCKS, TILES, & SHIELDS of any shape made to order.


MODERN GAS APPARATUS.

C. & W. WALKER, LTD.

London Office:
110, CANNON STREET, E.C.

Midland Iron-Works:
DONNINGTON, near NEWPORT, SALOP.

TIMMIS'S PATENT

CLINKERING DOOR.

For Illustrated Advertisement, with full Particulars, see "JOURNAL" for April 4, p. 66.

GEO. H. TIMMIS,
River Stour Works, STOURBRIDGE.
Telegrams: "TIMMIS, LYE." National Telephone: 13, LYE.
or of HARPER & MOORES, LTD.,
STOURBRIDGE.

RED BAND
UNBREAKABLE
INCANDESCENT MANTLE

Made in England, by a secret process, from 3-ply Ramie and strengthened to prevent breakage, 100-Candle power.

OUTSHINES & OUTLASTS ALL OTHERS.

Sample Dozen, post free 3/6.

LAW, 11, New Market St., BLACKBURN.

SAML. CUTLER & SONS,
MILLWALL, LONDON.

GASHOLDERS.
STEEL TANKS.
CONDENSERS.
ROOFS.

JÄGER GRIDS
CAPACITY OF PURIFIERS DOUBLED.
PRESSURE CONSIDERABLY REDUCED.

Special Circular describing the Jäger System of Purification on application.

CARBURETTED WATER GAS
Maximum Efficiency Guaranteed.

A LARGE NUMBER OF PLANTS IN OPERATION.

Every Requirement for Gas-Works.

(1284)

WELSBACH LIGHT

(PATENTED)

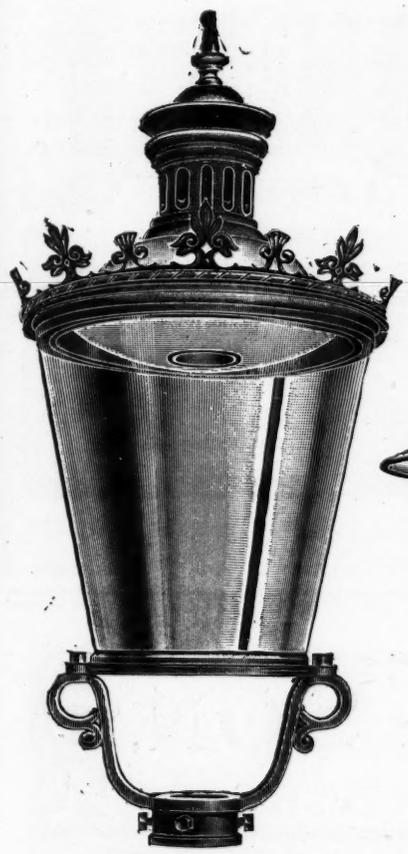


Fig. 35. 100 c.p.

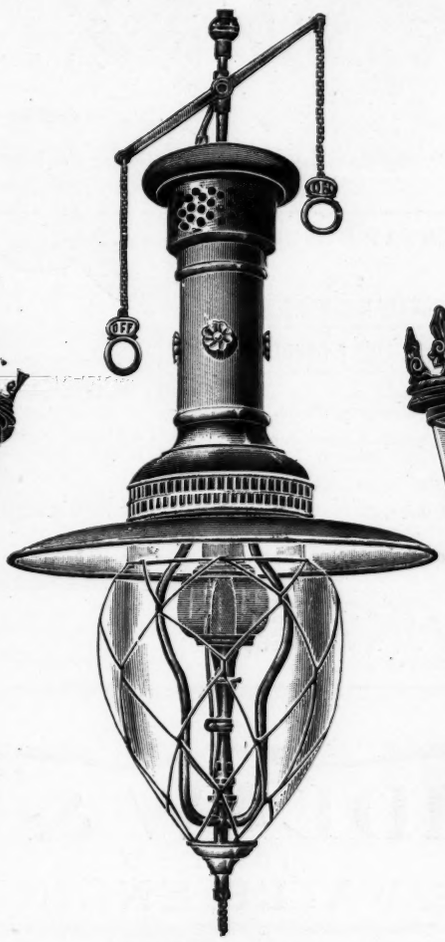


Fig. 607. 600 c.p.
Self-Intensifying.

Fig. 35a. 300 c.p.
Self-Intensifying.

WELSBACH "C," "CX," AND PLAISSETTY MANTLES,

4½d. each, subject.

Thousands of the above Lamps in use and giving satisfaction.

EACH LAMP AND MANTLE GUARANTEED.

THE

WELSBACH INCANDESCENT GASLIGHT CO.

LIMITED

2 to 14, Palmer Street, WESTMINSTER, S.W.

Telegrams: "WELSBACH, LONDON." *Telephone: 290 WEST.*

THOMAS BUGDEN,

India-Rubber, Guttapercha, Air-proof, and Waterproof Manufacturer,

116 & 118, Goswell Road, LONDON.

Gas Bags for repairing Mains Round Shape. All Seams Stitched and Taped.

Gas Bags for repairing Mains Cylinder Shape. All Seams Stitched and Taped.

Oilskin Clothing, Diving and Wading Dresses, Sewer Boots, Tar Hose, Stokers' Mitts, Bellows, &c.

Sewer and Fireman's Boots and Stockings

Contractors' and Miners' Woollen Jackets, Trousers Hats, &c.

ORIGINAL MAKER OF

GAS BAGS FOR MAINS.

†Patent applied for. Registered.

GREAT NOVELTY

THE

ROYAL† INCANDESCENT

GAS-LIGHT CANDLE.

The most decorative Gas-Light ever offered.

A perfect combustion Burner.

Cannot get out of order.

60-Candle Power with 2½ cubic feet of Gas.

Can be used anywhere instead of a "C" Burner.

Address of your nearest Wholesale Factor will be sent on application to No. 4374, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WELL ADVERTISED IN DAILY PRESS.

1¼d. profit on each Mantle. **3½ each** Make More Money.

BONBAC MANTLE

Whilst of better quality than usual brands, carries a larger margin of profit for the retail trade than all the other makes. *Sold at* **3½d.** *and* **4½d.**

Rapid and steady growing sales. Holds the premier place for cheapness, strength, durability, and brilliance.

Why pay 3/9 and 2/9 per dozen to retail respectively at 4½d. and 3½d. when each Bonbac Mantle sells at 3½d. and gives you a profit of 1¼d.

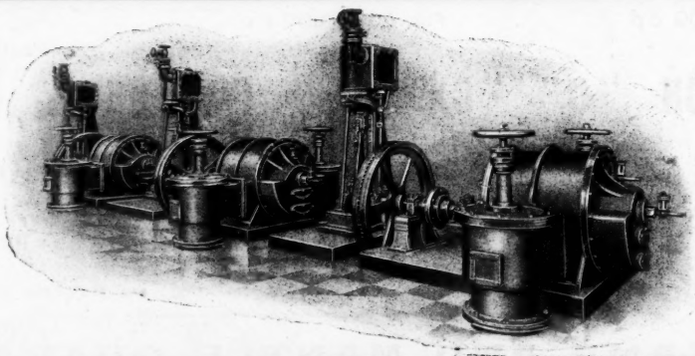
THE **Wholesale Fittings Co.** LTD. 30, Commercial St LONDON, E.

LEADING HOUSE FOR CHEAP INCANDESCENTS.

R. LAIDLAW & SON,

LIMITED

GAS & WATER ENGINEERS.



THREE SETS OF VERTICAL STEAM ENGINE & EXHAUSTER TOTAL CAPACITY 210 000 CUB. FT. OF GAS PER HOUR AT 60 REVS PER MINUTE SUPPLIED & ERECTED AT PORTSEA GAS WORKS.

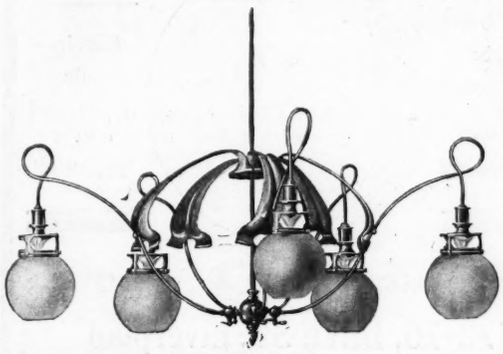
SIMON SQUARE · WORKS · EDINBURGH

6 LITTLE BUSH · LANE · LONDON, E.C.

ALLIANCE FOUNDRY & ENGINEERING WORKS, GLASGOW.

THE ORIGINAL NEW INVERTED BURNERS.

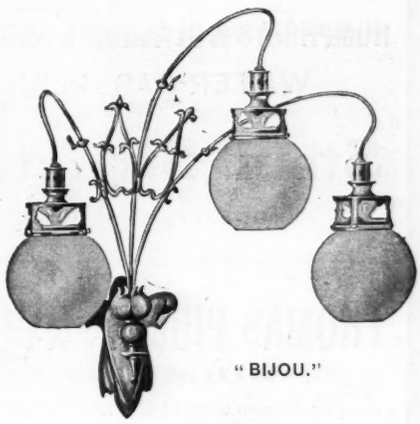
ARTISTIC! ECONOMICAL!



"BIJOU."

All Mantles we supply are made of best double-woven Ramie, and marked with our Trade Mark,

"NICO."



"BIJOU."

The "BIJOU" BURNER is the neatest, most decorative, and economical ever known, and is the real rival to Electric Light at One-tenth the cost.

No. 2 Burner.

New Season's Catalogue Now Ready.

Cluster Lamp. Fig. 6.

AN IDEAL LAMP FOR SHOP LIGHTING, WAREHOUSES, FACTORIES, PUBLIC BUILDINGS, and OUTSIDE LIGHTING.

The New Inverted Incandescent Gas Lamp Co., Ld.

23, FARRINGDON AVENUE, LONDON, E.C.

Gasholders
AND
GAS PLANTS.

Tanks,
CAST-IRON AND STEEL.

Patent Pressed Tanks from Stock.

HUMPHREYS & GLASGOW'S CARBURETTED WATER-GAS PLANTS.

Steel Structures
of every description.

THOMAS PIGGOTT & CO., LTD.,
BIRMINGHAM.
Telegrams: "ATLAS, B'HM." London Office: 63, QUEEN VICTORIA ST. Telephone: B'HM: 86 & 4546.

THE
"NEW PLANET"
INVERTED LAMP.

FROM **2/-**
Burner, Mantle, and Globe complete.
To the Trade only

Cheapest and most effective Burner made.

Genuine only if stamped "NEW PLANET."

PIFCO, LTD.,
72-76, Duke St., Liverpool.
PIONEERS OF MODERN GAS LIGHTING.

The Features of the
"SIMPLEX" PREPAYMENT METER.

NO REMOVAL OF METER.

NO Seals to hack out.
NO Screw Head to find.
NO reaching over Meter.
NO Numbers to look for.
NO Re-screwing.
NO Re-sealing.
NO bent Coin that is inserted into the Mechanism will jamb it.
NO second Coin can be inserted until previous one released by turning the handle.

TO CHANGE PRICE

merely unlock Padlock of Money Box, lift Flap at side, and change wheel.

THIS CAN BE DONE IN 30 SECONDS.

The Valve can be readily taken out to remove obstructions at any time without taking Meter down.

ALL BRASS AND GUN-METAL MECHANISM.

Ordinary and Prepayment Meters can be converted into SIMPLEX Prepayment or Convertible Stops.

QUOTATIONS ON APPLICATION.

METROPOLITAN GAS METERS, LIMITED,

Works and Offices:
HYSON GREEN WORKS, NOTTINGHAM.
Telegraphic Address "GASOMETER, LONDON."
Telephone: 204 X NOTTINGHAM.

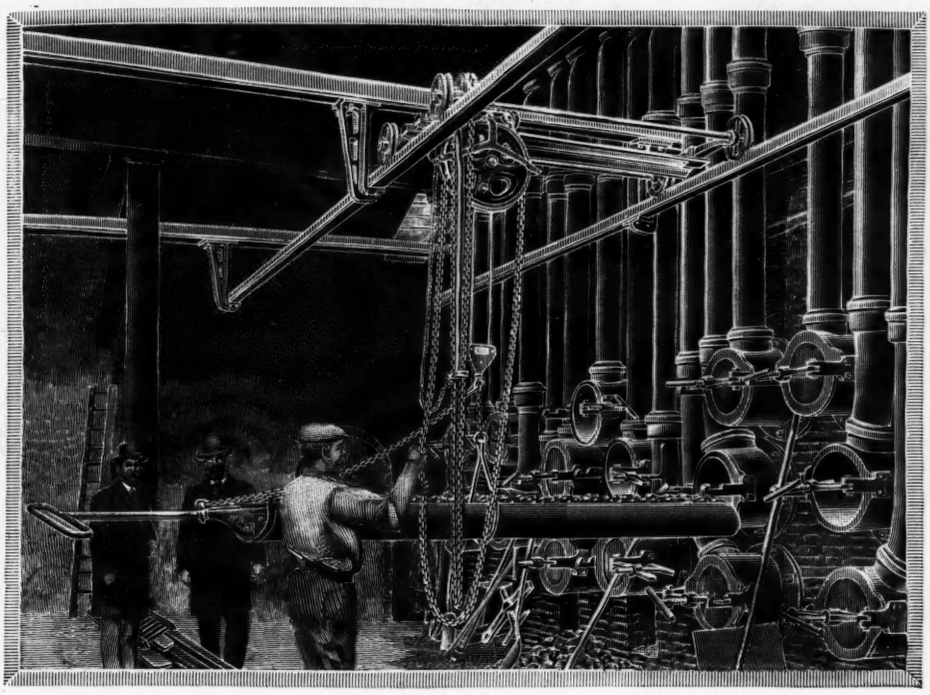
London Depot:
6, MALT STREET, OLD KENT ROAD, S.E.
Telegraphic Address: "GASOMETER, LONDON."
Telephone: 2044 HOP.

BIGGS, WALL, & CO.,

13, CROSS STREET, FINSBURY, LONDON, E.C.

Works: **New Southgate.**

Telegrams: "RAGOUT, LONDON."
Telephone: 273 CENTRAL.



As worked by one Man at Harlow Gas-Works.

"RAPID" MANUAL CHARGING MACHINE.

Annual Yield per Retort increased many thousands of feet.

EVEN CHARGES.

Repeat Orders—

Yeovil, Newport, Worthing, Southbank, Aldershot, Trowbridge.

Machines can be seen working at any of the following Gas-Works:—

ALDERSHOT, HARLOW, WORTHING, NEWPORT (MON.), YEOVIL, GRAYS, NORMANTON, TRURO, WESTON-SUPER-MARE, GOOLE, ABERGAVENNY, &c., &c.

The Sunny Light

is the light of the Lucas Lamp. There is nothing so beautifully soft; nothing so diffusive. There is a reason for it, and you know it. The Lucas principle means heat-preservation and perfect combustion—the superheating of the mantle. Hence superior light.

MOFFAT'S LTD., 155, FARRINGDON ROAD, E.C.

F. C. SUGDEN & Co.

CARBONIZING SPECIALISTS.

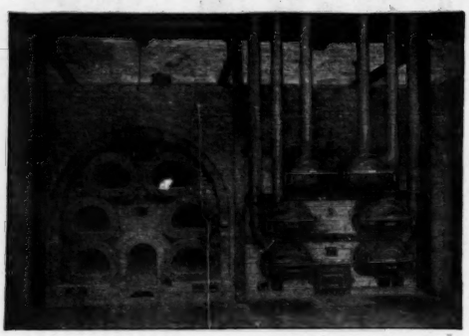


PHOTO. OF REGENERATOR SETTINGS DURING CONSTRUCTION.

REGENERATOR & GENERATOR SETTINGS

DEEP, SEMI-DEEP, AND SHALLOW.

Maximum Make per Ton and Mouthpiece.

Minimum Fuel Consumption.

NUMEROUS REPEAT ORDERS

Have been received for each of the above types of Settings.

RESULTS GUARANTEED. RETORTS RESET.

SOLE MAKERS OF **CRIPPS' PATENT CHIMNEY.**

Designs and Estimates on application. 28, EAST PARADE, **LEEDS.**

HARRIS & PEARSON,

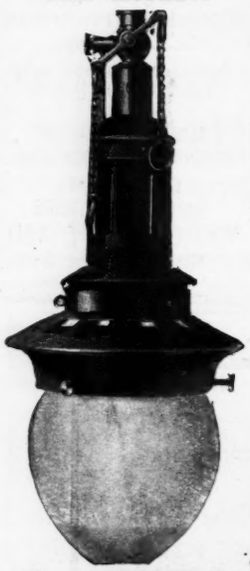
STOURBRIDGE, ENGLAND,

MANUFACTURERS OF

FIRE-CLAY GAS-RETORTS, FIRE-BRICKS, LUMPS, & TILES of Every Description.

GLAZED BRICKS AND PORCELAIN BATHS.

THE LATEST.



The "CORONA." Price complete, 6s.

G.I.C. PROOF POSITIVE. G.I.C.

A few G.I.C. Specialties with Prices.

G.I.C. Maintenance Mantles, for "C" and Kern Burners, **24/-** per gross.

G.I.C. Inverted Mantles, extra double Woven, **42/-** per gross.

G.I.C. Lucas Lamp, High Power and Mantles, for every known Burner, best and cheapest.

G.I.C. Inverted Burners, from **12/6** per doz.

G.I.C. Heavy Steatite Burners, **5/-** per dozen.

G.I.C. Heavy Steatite Bye-Pass Burner, **12/-** per dozen.

G.I.C. Bulbs, Globes, Chimneys, Protection Glasses, and everything for Maintenance at lowest Manufacturers' Prices.

New Lists of Novelties in Lamps, &c., sent on application.

THE GENERAL INCANDESCENT CO., LD.,

52, Great Eastern Street, LONDON, E.C.,

And at BERLIN, MANCHESTER, DERBY, and NOTTINGHAM.

THE LEEDS FIRECLAY CO., LTD.,

CLIFF'S BRAND.

INGHAM'S BRAND.

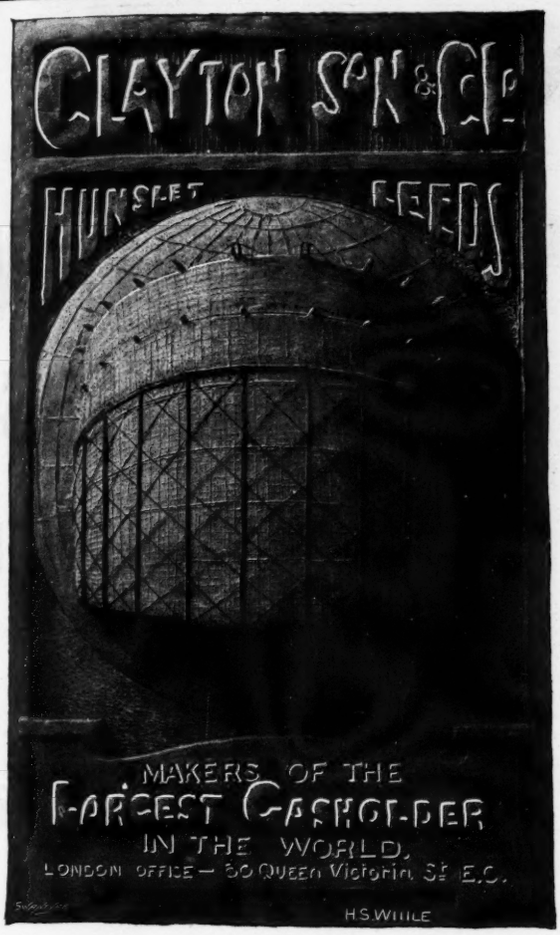
Fire-Bricks, Lumps, Tiles, &c., &c., of every description suitable for Gas-Works.

Patent MACHINE-MADE RETORTS

These Patent Machine-Made Retorts possess the excellent quality of remaining as near stationary as possible under the varying conditions of their work—a quality which will be appreciated by all Gas Engineers and Managers. The generally expressed opinion is that these Retorts are the very best that are made. *Retorts carefully Packed for Export.*

LONDON: 2 & 3, NORFOLK STREET, STRAND, W.C.

LEEDS: 20, Park Row. LIVERPOOL: 21, Leeds Street.



MANNESMANN

LAMP POSTS

made throughout of
WELDLESS STEEL TUBING
including base, ring, and ladder rest.

Light, Strong, Unbreakable, and Cheap.

GAS, WATER, & STEAM TUBES AND FITTINGS.

WELDLESS STEEL SPIGOT & FAUCET PIPES for Gas and Water Mains.

Tubes can be supplied up to 10 inches diameter and in lengths up to 40 feet.

THE BRITISH MANNESMANN TUBE COMPANY, LTD.,
110, CANNON ST., LONDON, E.C.
Birmingham Depôt: Bridge Works, LISTER ST.
Works: LANDORE, SOUTH WALES.

PATENTEES & EXPERTS

SAFETY. REMEMBER. ECONOMY.

150 ARE AT WORK. MANY REPEAT ORDERS.

DEMPSTER'S IMPROVED PATENT SPIRAL GUIDED GASHOLDERS.

AVOID COLOURABLE IMITATIONS AND INSIST UPON HAVING PATENT SPIRAL PLATES.

THESE PERFECTED SPIRAL GASHOLDERS HAVE STOOD ALL TESTS, & ARE THE SAFEST GASHOLDERS IN THE WORLD. GUIDES & ROLLERS ALWAYS ACCESSIBLE.

"YOUR SPIRAL HOLDER STANDS LIKE A ROCK."

R. & J. DEMPSTER, LTD., MANCHESTER.

PARKINSON'S

STATION METERS IN RECTANGULAR TANKS OF ELEGANT DESIGN.

PARKINSON'S PATENT EQUILIBRIUM GOVERNORS.

These Governors are being used at a great many Works, and all Engineers speak of them in words of unqualified praise.

FITTED WITH SIX COLUMNS and GIRDERS, WEIGHTS or WATER PRESSURE.

PARKINSON AND W. & B. COWAN, LTD.,
(*Parkinson Branch*),
COTTAGE LANE, CITY ROAD, LONDON.
BELL BARN ROAD, BIRMINGHAM.

Printed for WALTER KING by King, Sell, & Olding, Ltd.; and published by him at 11, BOLT COURT, FLEET STREET, in the CITY OF LONDON.—Tuesday, Dec. 19, 1905.